SCIENTIFIC AMERICAN

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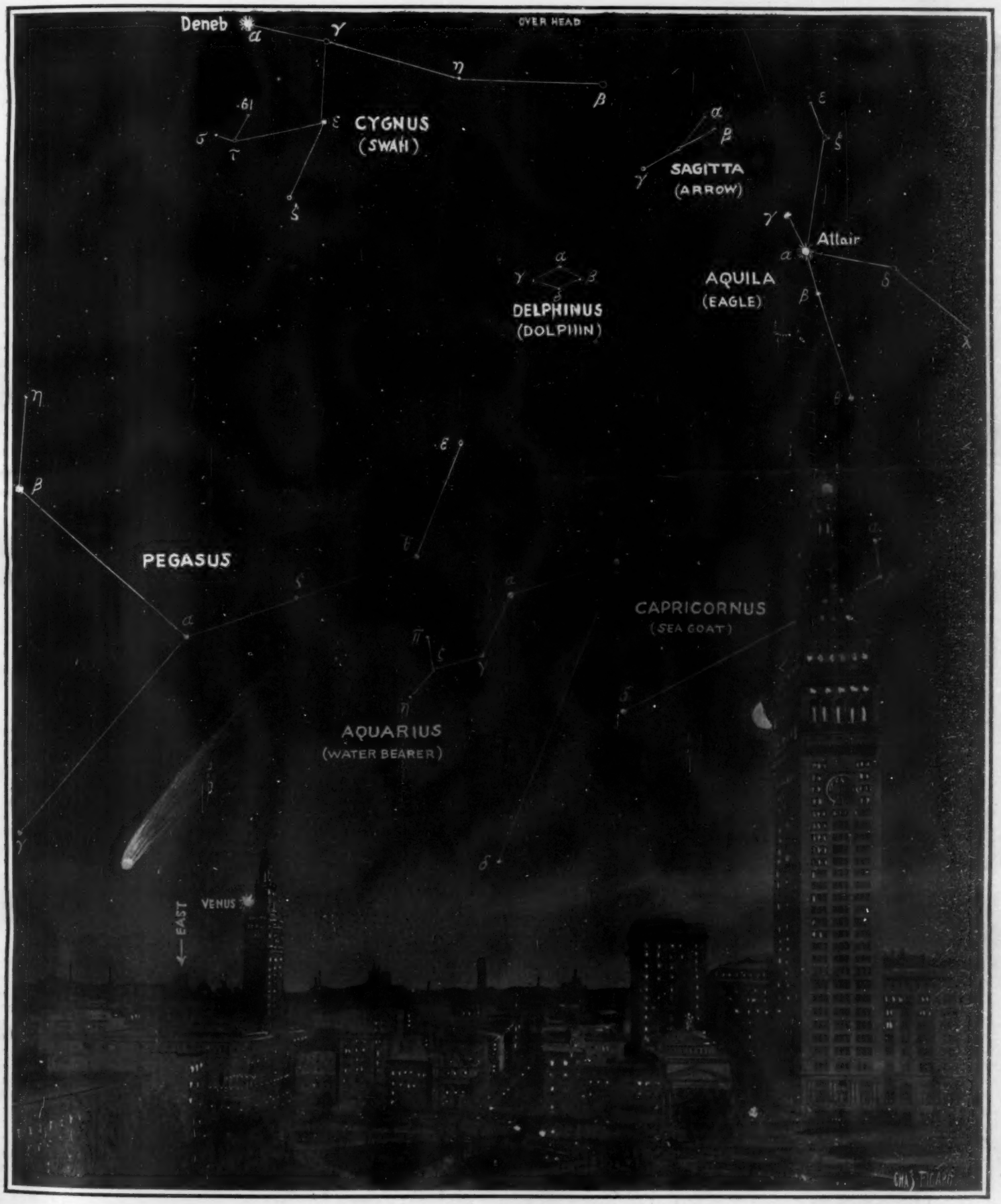

Halley's comet is now visible to the naked eye in the eastern skies, just before dawn. Its appearance on May 2nd, one hour before sunrise, is here depicted.

HALLEY'S COMET AT ITS BRIGHTEST.—[See page 317.]

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NEW YORK, SATURDAY, APRIL 16th, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE WORLD'S FAIR OF THE FUTURE.

IN all probability the city of San Francisco will hold an international exposition, or, as it is more popularly known, a "World's Fair," to celebrate the opening of the Panama Canal in 1915. If the promoters of the fair are willing to profit by the lessons of former expositions, their efforts will be directed to making the coming fair notable, not for mere bulk and area, but for its compactness and the genuine excellence of its carefully selected exhibits. The trouble with many previous expositions has been that they were big to the point of being wearisome and oppressive. A climax in this direction was reached at the St. Louis Fair, in one single building of which a visitor had to traverse nine miles of aisles if he wished merely to walk past the whole of the exhibits. Whatever may be the ulterior motive, the avowed object of these exhibitions is educational. Therefore, they should contain only the most distinctive and valuable results of the world's scientific, industrial, sociological, and constructive work. And in this connection we would ask whether it is not almost an insult to the good taste and intelligence of the millions that are solicited to enter such an exposition, if a large section of its space is devoted to that cheap form of entertainment which was inaugurated by the notorious Midway Plaisance at the Chicago Exposition. San Francisco will have a great opportunity, by breaking away from certain false traditions, to render this, the latest of the expositions, something better than a mere plaything of the real-estate dealer, the side-show man, and the politician.

GYROSCOPIC EFFECT OF REVOLVING AEROPLANE MOTORS.

THERE were certain conditions in the recent fatal accident to Le Blon, which suggest that the gyroscopic effect of the motor may have contributed to the disaster. He was using a light monoplane of the Bleriot type, driven by a Gnome revolving motor. The aeroplane, although apparently intact and in good working order, became unmanageable, and turning completely over, fell to the ground. Now, the gyroscopic effect of the 167-pound motor, running at 1,200 revolutions per minute, must have been considerable. A sudden turning of the aeroplane to the right or left by the aviator would produce a strong upward or downward gyroscopic tipping tendency in the longitudinal direction. If this tendency were aggravated by a gust of wind, it is conceivable that the aviator would be unable to control the situation sufficiently to prevent a complete upset. At the time of his fall Le Blon was flying above the bay at San Sebastian, Spain, in a high, gusty wind. Is it not possible that the joint action of the wind and the gyroscopic effect of the engine and propeller was responsible for the disaster? The tragic death of Delagrange when he was using a monoplane equipped with the same type of motor suggests that his sudden upset may have been due, in some measure, to similar causes.

GUN RECORDS IN OUR OWN AND THE BRITISH NAVY.

WE are frequently asked by correspondents to give some comparative figures showing the relative excellence of the shooting in our own and other navies. We would gladly do so; but it is a fact that there is no information regarding the navies of the world more difficult to obtain than this; France and Germany, in particular, never giving to the world the results of target practice. Both the United States and Great Britain, however, do publish such figures. But even here it is often difficult to establish accurate comparisons, because the data which is made public is seldom complete, either the range or the size of the target being frequently omitted, and no statement being made as to whether target or ship or both were moving. However, we offer the following comparison, which is based upon official figures.

The Engineer of London states that the results for the past year have shown that each 12-inch and 10-inch gun has averaged 0.63 hit; each 9.2-inch gun, 1.94 hits; and each 7.5-inch gun, 2.47 hits; these being the average number of hits per gun per minute for the whole navy. The 6-inch, 4.7-inch, and 4-inch guns varied from slightly over 4 hits per minute for the 6-inch to 9 hits per minute for the 4-inch.

By the courtesy of Rear Admiral Mason, Chief of the Bureau of Ordnance, we are enabled to publish the average results obtained on all the guns on all the ships taking part in target practice in the United States navy. Whether the ranges and the size of the targets corresponded to those in the British navy, we are unable to say. The results are, for the 12-inch guns, 0.72 hit per gun per minute; for the 10-inch, 0.76; for the 8-inch, 1.83; and for the 7-inch, 3.13 hits per gun per minute; while the results obtained with the 6-inch, 5-inch, 4-inch, and 3-inch were practically the same as were obtained in the British navy. One 7-inch gun holds the remarkable record of 10.26 hits per minute; while the highest score with the 12-inch gun, firing when the ship was under way in smooth water, was 3 hits per gun per minute obtained on the United States ship "Ohio."

CERTAIN ADVANTAGES OF LIQUID FUEL.

TO judge from a succession of articles which have been appearing in one of the newer and certainly the most noisy of the London daily papers, on the use of liquid fuel in the British navy, one would suppose that the virtues of this fuel had only recently been discovered, and that the Admiralty had determined to abolish its coal depots and turn the bunker rooms of its warships into oil tanks. As a matter of fact, any such sweeping substitution of oil fuel for coal is not now contemplated, nor ever will be, either in the British or any other navy. The natural sources of oil supply are not sufficient in capacity, nor are they so widely distributed, as to make it possible either for the merchant marine or the navies of the world to make a wholesale substitution of oil for coal. Some countries, notably the United States and Russia, possess such abundant supplies that they could, if they so wished, make a much more complete use of oil; and, because of this advantage, it is not unlikely that our navy, at least, will ultimately make a more extensive use of oil fuel than the navy of any other power.

The advantages of oil over coal are so many that were there as much oil in sight as coal, the new fuel would inevitably supersede the old altogether. In the first place, the higher evaporative value of liquid fuel not only enables a larger quantity of fuel to be carried in the same space, but its use renders possible a decrease of 75 per cent in the number of stokers, or fire-room attendants. Being in the liquid form it can be employed as ballast and pumped into remote quarters of the ship far removed from the boiler room, and inaccessible for the handling and transportation of coal. For the merchant ship this means not only a saving in the fuel and labor bill, but a positive gain in cargo capacity; while for the warship there is a similar reduction of expense, and, what is of far greater value, a considerable extension of the cruising radius, or the distance over which the ship can travel without replenishing her fuel supply. For the merchant ship there is the further advantage that the bunkers can be filled by a pipe line without the delay, dirt and disorder which accompany the present coaling operations; while for the warship there is the strategic advantage that the ship can take on fuel by a pipe line from a tank ship at any place and in any but heavy weather. Furthermore, the use of oil enables a whole fleet to steam without emitting those tell-tale clouds of smoke which are one of the surest means of betraying its presence to the enemy.

ANCIENT AND MODERN IRRIGATION.

A STRONG sentimental interest will be aroused by the announcement that the great irrigation works, which at the very dawn of history rendered the land of Mesopotamia a garden of fertility, are now being repeated on an extensive scale under the same engineer who was responsible for the very successful irrigation works in the valley of the Nile. Our United States Consul at Bagdad, Turkey, speaking of the importance of these works, says that if the plan should succeed only in part, it promises to revolutionize commerce and shift trade balances and traffic in that part of the world. A total of 12,500,000 acres of land is to be reclaimed at an estimated cost of $18 per acre; and so fertile is the land when properly irrigated, that its estimated value, according to the Turkish government, will be $155 per acre, the soil being capable of yielding large crops of wheat, barley, and cotton.

We spoke of sentiment entering into the interest with which we regard this work; and there is certainly something that appeals strongly to the imagination in the fact that both in ancient Egypt and in even more ancient Mesopotamia, the Anglo-Saxon, after a lapse of four or five thousand years, should be repeating on a larger scale and with the greater skill rendered possible by modern appliances, those feats of irrigation which are one of the chief glories of the ancient, but never-to-be-forgotten, races that once flourished in the valleys of the Nile and the Euphrates.

Whatever may be the future fate of the great Anglo-Saxon race, the vast works of irrigation which it has carried out in India and in Egypt and is now actively prosecuting in Mesopotamia, must ever stand out as one of the brightest evidences of its civilizing and uplifting activity.

During the recent progress of President Roosevelt down the valley of the Nile, his visit to the great reservoir at Assouan and the sight of the marvelous fertility with which it has enriched the valley below, must have carried his thought to those even greater works of irrigation which are now being prosecuted in the arid region of our Western States; works which owe their inception largely to his own tireless energy and enthusiasm. Here also the latest and most powerful branch of the great Anglo-Saxon race, in the space of a few years, has completed the initial work for a project which promises to bring thirty million acres of unproductive land under the richest cultivation. And in this connection it is timely to draw attention to the great ability with which the Reclamation Service has done and is now carrying on its work. A well-deserved tribute to the engineers in charge was recently made by Senator Newland of Nevada, in which he stated that the projects had been for the most part wisely selected and the work well done; such mistakes, none of them serious, as have been made, being the result of the extraordinary pressure brought to bear upon the Reclamation Service by the political representatives of the regions affected. Said the Senator: "We have had one of the most capable and honest construction services organized that has ever existed in the history of this country. The Committee on Irrigation of the Senate has been engaged during the past year in visiting these various works, and not a whisper of corruption has reached them. It has been a work conducted with rare intelligence, with rare integrity, and with rare speed."

The work already accomplished consists in the provision of dams, headworks, etc., and the $30,000,000 now required is for the purpose of utilizing the water so stored, by the construction of canals for distributing the supply upon the millions of acres which only await its arrival to spring into instant fertility.

TESTS OF TUNGSTEN LAMPS.

IN a bulletin recently issued by the University of Illinois T. H. Amrine and A. Guell present the results of an important study of various types of tungsten and incandescent lamps, a study which should prove of considerable interest in view of the growing importance of metallic filament illumination. The conclusions of their investigation may be thus summarized:

Comparisons of the durability of filaments made by the colloid, deposition, and paste processes are very difficult to make because the three types are usually mounted differently. Undoubtedly the manner of mounting the filament has a great effect upon its life, and whether the superior life of one type lamp is due to the fact that it has a better scheme of mounting or to the fact that the process of manufacturing is better, can hardly be decided definitely from these tests. Tests of filaments made by the three processes and mounted in exactly the same way would be necessary to decide the question definitely. From the tests described, however, the colloid process seems to give a filament that is less durable than the other two. The tests show that performances of tungsten lamps vary to a surprising degree, depending upon the kind of lamps used and upon the conditions under which they are burned. Some lamps will give as high an operating cost as the old carbon lamps while burning under certain conditions, whereas other lamps will give good results under those same conditions. Under the best conditions, however, the tungsten lamps now on the market give excellent results. Their efficiency is maintained in a remarkable way and the life is very long, often several times what the advertised life is. Breakages in shipment and handling have been reduced to a small fraction of what was formerly common. Of three hundred lamps purchased for the tests by the experimenters, only three were received with broken filaments; and although the lamps in some of the tests were handled dozens of times, almost no trouble was experienced so far as the breakage of filaments was concerned.

ENGINEERING.

The Minister of Public Works of Panama will shortly ask for bids for the construction of a railroad from Panama to David, a distance of 200 miles. Bids will be asked also for lines from David to Bocas del Toro, and from Panama to Los Santos.

The Navy Department recommends an appropriation of $10,000 for prizes, etc., to be awarded ships in commission for general efficiency and economy in coal consumption. It is estimated by the Department that competitions of this character have resulted, and will continue to result, in a saving of ten per cent in coal consumption.

In spite of the steady increase in passenger travel in this city, the opening of the new East River bridges is beginning to tell heavily upon the traffic over the East River ferries. The Union Ferry Company of Brooklyn has been obliged to discharge three boat crews, and change the schedule on three different lines from a 10-minute to a 20-minute headway.

Acting on the recommendation of the Public Service Commission, the Interborough Company of this city will install cars with destination signs on the elevated lines, which will automatically tell the name of the station the train is approaching. The great convenience of this arrangement to the traveling public will be out of all proportion to the small cost of putting it in place.

The British Navy estimates for the present year call for five battleships of the dreadnought type, five protected cruisers of 25 knots or over, twenty destroyers, a number of submarines, and two floating docks. Including the ships to be laid down this year, the dreadnoughts built or building for the three leading naval powers are for Great Britain, 27; Germany, 17; United States, 10.

Speaking on the subject of defective open-hearth rails, at the last annual convention of the American Society for Testing Materials, Robert Job emphasizes the fact that the mere term "open-hearth" is in itself no guarantee that the rails made under that system will give good service; since they are subject to the same general defects of manufacture as Bessemer rails, and hence require equal care during rolling, etc.

The Pennsylvania Railroad recently ran its first Pullman train from Harrison, N. J., by way of its new tunnel system to Long Island and return. It will be three or four months, however, before the whole system is thrown open for public service. The tunnels to Long Island, unless the plans of the company miscarry, will be publicly opened on the 15th of May, and those to the westward under the Hudson River by about the 15th of July.

The Army Board is making some important experiments to determine the resisting power of a solid mass of concrete, as compared with armor plate. In a recent test with a 12-inch gun, a shot was fired which penetrated the concrete for a distance of 21 feet, which is equivalent to the piercing of a 19-inch armor plate. The target is now being reconstructed for tests with the new 14-inch gun, which it is expected will give even better results.

The Director of the Royal Dockyard at Castellamare, Italy, has produced, if the reports are to be believed, a torpedo boat without funnels. By means of electrical ventilators the products of combustion are discharged from the vessel without the assistance of smokestacks. The first experiments, on a trip from Castellamare to Naples, are said to have been extremely successful, no smoke being shown and the vessel getting up steam with great rapidity.

The shortage or surplusage of freight cars is one of the reliable indications of business activity, if not of business prosperity. The great surplus of cars which existed at the time of the panic in November, 1907, was gradually reduced until it was wiped out in the autumn of 1909. To-day, not only is there no surplus, but the indications are that during the coming season there will be a large shortage, due to the steadily increasing volume of business.

The Hudson and Manhattan Railroad Company has built two steel cars which are specially designed for transporting baggage between the steam railway terminals, which are served by the Hudson River tunnels. With a view to avoiding extra handling and trucking, each car is arranged to receive eight loaded baggage trucks, which are loaded and unloaded between platform and car over folding steel plate aprons, which form part of the permanent attachments of the car.

The Isthmian Canal Commission has called for the manufacture, delivery, and erection of about 58,000 tons of steel parts, which will be used in the construction of the forty-six mitering lock gates of two leaves each on the Panama Canal. These are the largest lock gates ever built. They are all about 65 feet wide, and vary from 47 feet 4 inches to 82 feet in height. Piled one above the other on end they would make a tower 11/5 miles in height. The contract will be worth about $6,000,000.

ELECTRICITY.

At Harvard University a wireless telegraph club has been formed with a view to studying wireless telegraphy, and one of the special objects is to discover some method of overcoming amateur interference.

Some time ago the United States Steel Corporation installed two Heroult furnaces, one at Worcester, Mass., and the other at South Chicago. These furnaces have been in constant service ever since, doing twelve heats per day. It requires between an hour and an hour and a half to refine a metric ton of steel, and 190 kilowatt hours are consumed to desulphurize and dephosphorize the metal. The cost of repairs on the furnace has amounted to about six cents per ton of steel, and the electrodes are consumed at the rate of six pounds per ton.

A test of the telephone service in Wisconsin was recently made by a commission. The investigation was carried on secretly, so as to determine the actual conditions of service. It was found that the average time between a call and a response was 4.78 seconds. The quickest average response came in 3.17 seconds, and the slowest in 7.3 seconds. Those exchanges which most quickly responded to a call were found to be more efficient in every other respect as well, so that this single test provided a gage of the service offered by the exchanges.

It is remarkable that while wireless telegraphy has made rapid strides, very important considerations have been almost entirely neglected. Much attention has been paid to attunement and selectivity and also to the refinement of instruments, while the development of the antenna has been slow. At the receiving station particularly not much has been done toward locating the antenna wires so as to intercept a maximum of wave energy. Aside from Braun's fan-shaped grid, which marked an epoch, very little along this line has been extensively adopted in practice.

A telephone cable loaded with Pupin coils was laid in Lake Constance in 1906. This was a lead-covered cable, and it was very difficult to lay it on account of its great weight. Mr. Dieselhorst, who laid the cable, has been experimenting with loaded submarine telephone cables, and has evolved a construction which is to be used across the English Channel to connect London with Paris. The cable is covered with guttapercha and wire sheathing, and the loading coils have been introduced so ingeniously as to increase the diameter of the cable from one inch to but three inches. So gradually is the cable swelled at the loading points, that it can be paid out over a four-foot sheave wheel. The cable has been tested in salt water for fifteen months, and from time to time has been subjected to pressures of four tons per square inch.

A series of tests has recently been made to determine the strength of the metallic filaments of lamps and their resistance to shock. The lamps were tested by placing them at the bottom of an inclined plane, and rolling rubber balls filled with lead down the plane. The shock was varied by starting the balls at different distances from the lamps. It was found that with lamps of equal voltage the strength of the filament varied inversely as the candle-power and for lamps of equal candle-power the strength varied inversely as the voltage. In some lamps it was found that certain parts were more sensitive to shock than the filaments. When the filaments were heated to a white heat they became too flexible to be broken by a shock, but the loops were distorted under repeated blows until they came in contact with each other.

Sterilization of white wine is the object of a paper presented to the Académie des Sciences by Messrs. Maurain and Warcollier. Previously they studied the action of ultra-violet rays from a quartz mercury vapor lamp upon cider in fermentation. With the same apparatus they made researches upon sparkling white wine and found how much time it took for the rays to act upon different thicknesses of layer so as to destroy the fermenting principle and thus prevent any new fermentation. Using layers of wine of ¼ millimeter (0.01 inch) held between a 0.2 inch quartz plate and a glass plate and exposed to the lamp so that this latter was 1.6 inches distant, they found that fermentation was stopped in all cases for an exposure of above 10 seconds and never for an exposure below 5 seconds. With 1.7 millimeters (0.07 inch) exposed at the same distance from the lamp, fermentation was always stopped after an exposure of over 1 minute and never in less than 30 seconds. It is to be noted that in the case of pure cider, to sterilize it we need an exposure of over 2 or 3 minutes for the first mentioned thickness of layer, and sterilization is not reached even after 15 minutes exposure for a 0.04 inch layer. Thus it will be seen that the sterilizing of white wine can be more easily carried out than that of cider, this being no doubt due to the fact that the wine is more transparent to ultra-violet rays.

SCIENCE.

Prof. Hilprecht's tablet, said to uphold the Biblical account of the Deluge, was discussed at a meeting of the American Oriental Society at the Johns Hopkins University. Prof. G. A. Barton of Bryn Mawr College, Prof. Paul Haupt of Johns Hopkins University, and Prof. Albert T. Clay of Yale University, thought that Prof. Hilprecht had been too imaginative in interpreting the fragmentary inscription. It is asserted that the restoration made by Prof. Hilprecht in filling in broken lines were conjectural emendations. Prof. Hilprecht's claim that the tablet was written some time between 2137 and 2005 B. C. is regarded as unfounded, it being stated that the tablet belongs to a much later period.

The perfume and flavor of vanilla are due to a substance called vanillin, which also occurs as an ingredient of numerous resins. Vanillin has been made synthetically by Tiemann and Maarmann from coniferin, a glucoside which is found in various species of conifers. The same chemists subsequently made the commercial synthesis of vanillin possible by substituting eugenol for coniferin. The price of vanillin has fallen from $770 per pound in 1876 to $4 per pound in 1909. A further reduction is scarcely possible because of the high price of eugenol. Hence chemists have been experimenting in another direction, and Guyot and Gry have applied to the preparation of vanillin the general methods of synthesis of aromatic aldehydes, which were recently discovered by Guyot. Their experiments are described in a recent number of the Bulletin de la Société d'Encouragement.

The price of pure Para India rubber, which in 1903 was 88 cents per pound, rose last year to $2.25 per pound. This increase in price gives additional interest to the processes of regeneration of waste rubber and of the manufacture of substitutes. The regeneration of vulcanized India rubber consists in removing the sulphur, which was added in the process of vulcanization. The scrap rubber is assorted according to quality, and is treated either with sulphuric acid or with potash, for the purpose of destroying fibers of cloth, etc., and of removing the greater part of the sulphur. The material is then ground and washed. This regenerated India rubber is used only as an addition, in small proportions, to new rubber. Artificial or imitation rubber is made by methods which resemble the process of vulcanizing natural India rubber; for example, by treating linseed oil with sulphur or sulphur chloride.

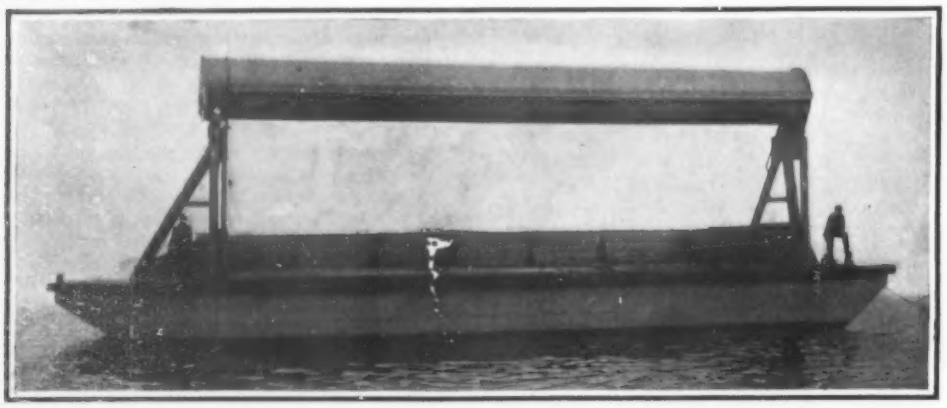
One of the most interesting results of the Smithsonian African Expedition has just been published by Mr. Gerrit S. Miller, Jr., curator of the Division of Mammals, U. S. National Museum, under the title of "Description of a New Species of Hippopotamus." There have been for some years in the collections of the National Museum two skulls of hippopotami, one of which was from the Zambesi River, East Africa, and the other from Angola, West Africa. These skulls differed materially in several details of form, chiefly, however, in the constricted shape of the rostrum, but the characters were not deemed of sufficient value to justify the creation of a new species, for the differences might have been due to individual variations. The receipt of eight skulls from British East Africa, collected by the Smithsonian African Expedition, showed conclusively that the individual variations were so slight in the East African specimens that Mr. Miller was led to believe that the two skulls represented two distinct species, one from East Africa and one from West Africa. A critical study of the skulls revealed other differences in their characters that were of sufficient importance to justify Mr. Miller in making a new species of the West African specimen, to which he gives the name *constrictus*.

The gas bags of modern balloons are made of a cotton fabric coated with India rubber in the most careful manner, in order to assure perfect impermeability without sacrificing lightness. For all large balloons, and especially for dirigibles, two layers of cloth are superposed and cemented together. The outer skin is covered with India rubber on one side only, but the inner skin is coated on both sides. In German balloons the inner canvas is cut straight and the outer canvas is cut bias. In this construction, gores with angles of 45 deg. are used and the seams are covered, which causes a slight increase in weight. French balloon makers prefer to cut both canvases straight. Experiments show that the tensile strength of the envelopes thus made is approximately equal in all directions. Each method of construction has its advantages and its defects. As India rubber, even when vulcanized, is altered by exposure to light, the canvas is colored yellow in order to arrest the violet and ultra-violet rays, which are the most active. The pigment used in France is chromate of lead, which unfortunately must be applied to the canvas before it is coated with rubber, and which consequently prevents the vulcanization of the rubber, because the chromate of lead is blackened by heat. Picric acid is free from this objection, but its employment is too dangerous.

THE "VIKING"—SELF-DUMPING DECK SCOW.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

A novel system of self-dumping scow, especially designed for the discharge of rock and solid debris, has been devised by Mr. A. F. Viking, engineer and shipbuilder of Stockholm. At this port the economical dumping of such material into the water is of particular interest, inasmuch as the blasting of rock in connection with the extensions to the harbor or the streets of the city is in continuous progress. Several designs for automatic dumping have been evolved, but the "Viking" system, so called after its designer, has been the first to be submitted to practical test, and has proved remarkably successful. Through the courtesy of the inventor we are enabled to illustrate and describe this new barge. It differs in its action from any other vessels of this class in service, inasmuch as instead of the contents being dumped through self-opening doors in the bottom of the hull, the scow is tipped over on its beam ends by a very simple action. The load is carried on a flush deck, or the latter is fitted with low bulwarks. On one side, extending the full length of the scow, is an elevated cylindrical tank *D*, mounted about 16 feet above the level of the deck on two tripods. When it is desired to dump the barge, the equilibrium of the latter is upset merely by forcing water through the agency of compressed air into the elevated tank, which causes the scow to tilt over and shoot its load. Should the flush deck be fitted with low bulwarks, these are fashioned in the form of bottom hinged doors on the discharging side, so that they fall down as the barge heels over, and permit the load to be shot cleanly.



After dumping, the scow returns to an even keel.

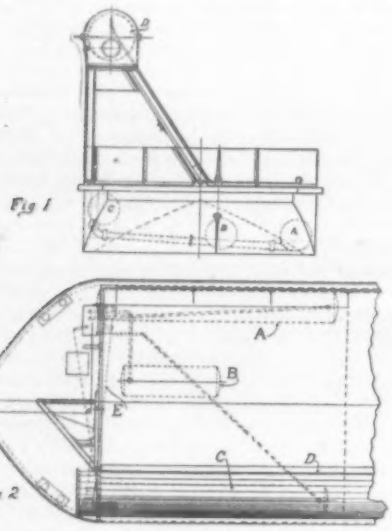
In the hold of the scow on the side opposite the elevated cylindrical tank is carried another tubular tank *A*, about half the length of the former. This is filled with water, and in the case of the scow illustrated, holds about six tons for a load of 200 tons on the deck. Alongside this water tank is a small cylindrical vessel *B*, containing compressed air, the pressure being approximately seven atmospheres. On the same side as the elevated tank, in the hold below, is a third cylinder *C*, also about half the length of the elevated cylinder, which at first is empty, but which is always open to the outer atmosphere through a small pipe.

The water vessel *A* in the body of the pontoon is in open communication by means of a pipe *E* with the elevated tank, and the former is also in connection by another pipe with a valve box placed at the foot of the tripod carrying the upper tank. When the valve in this box is in its initial position, this second communicating pipe is open to the free atmosphere. The compressed-air vessel is also connected to this valve box, but is shut off from the same until ready for dumping. The third vessel below the elevated cylinder, as already mentioned, is always open to the free atmosphere through a pipe, but there is a second pipe and valve provided in connection with the main communicating pipe between the first water tank and the elevated cylinder. It will thus be seen that there is always open communication between the first water tank and the elevated cylinder by means of a main pipe which is carried up alongside the vertical leg of the tripod at one end. In addition there is a smaller air pipe running up one of the triangular legs and passing right into the body of the tank, having its outlet near the top of the cylinder inside. This pipe is in connection with the outer atmosphere, so that normally the upper vessel is full of air.

The load is stowed on deck in the manner shown in the illustration. When rock is handled, bulwarks on three sides only are necessary, the fourth side, from which dumping is effected, below the elevated tank, being left quite open or at the most having only a low ridge. If soft material is carried, hinged doors, as already described, may be used, these automatically opening under the pressure from the load on deck when the scow is inclined in the dumping operation, and falling flat and clear, so as not to obstruct the shoot.

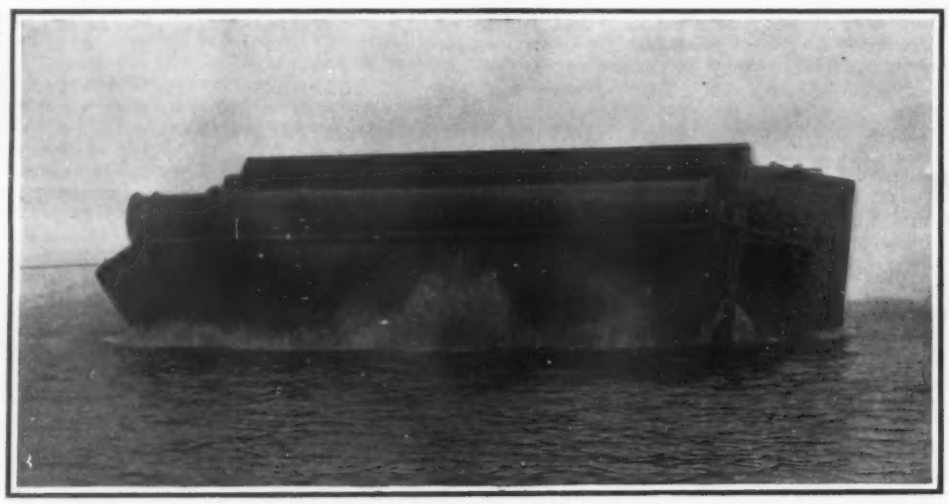
When the loaded barge has been towed to the dumping site, a cord is pulled connecting the mechanism of the scow with the tug. This opens a valve, which permits the compressed air to flow to the valve box, and also a slide valve in the latter, whereby the compressed air is admitted into the lower water vessel *A*. The pressure exerted forces the water from the lower tank into the elevated cylinder *D*, the displaced air in the latter escaping; and, as the upper tank becomes charged, the barge loses its equilibrium, heels over on the elevated tank side, and the load slips off the inclined deck into the water. When the load is shot the control cord is again pulled, the slide valve in the valve box is returned to its normal position, cutting off the supply of compressed air to the lower water tank, and at the same time opening the latter to the free air.

The load may slip off the deck at varying inclinations, this factor depending on the friction between the load and the deck and the character of the débris. If the slipping takes place early, at a low deck inclination, the upper cylinder may never reach the water, for the scow rights itself immediately the load is discharged. Should such result, the water forced into the elevated tank returns to the lower water tank directly the compressed-air supply to the latter is cut off by the second pull of the cord controlling the mechanism. It may happen, however, that the scow heels right over, and the upper tank is brought into the water, the barge thus floating in an inclined position. To bring it back to the upright position a third pull is given to the control rope, which at once opens the communication between the upper tank *D* and the water vessel *C* placed immediately below it in the hold. As this latter tank is always placed in a position lower than the elevated cylinder, the water must flow by gravitation into it. When a sufficient quantity of water has passed from the upper to the lower cylinder, the barge rights itself, and the water remaining in the elevated tank as well as that in the tank immediately below, returns to the main water cylinder on the opposite side of the vessel in the hold, by gravitation. This accomplished, a fourth pull on the control cord returns all parts to their original positions. The compressed air is fed into its vessel by means of a hose coupled to a valve in the top of the air chest, and when sufficiently charged the valve is closed and the hose removed. When the barge is in an upright position, all water in



A, B, C, D are ballast tanks by the emptying and filling of which the scow is dumped and righted.

End elevation and half-deck plan of scow.



The scow tilted and load sliding into the water.

Loaded and ready for dumping.

THE "VIKING"—A SELF-DUMPING DECK SCOW.

the elevated tank, or the one immediately below it, must return to the first tank on the opposite side of the barge, as this latter is placed at the lowest point, the return being purely gravitational. It will also be seen that the water circulating between the tanks cannot escape. Glycerine is mixed with the water to prevent freezing in cold weather, so that the system can be used any time of the year irrespective of climatic conditions.

The scow shown in the accompanying illustrations is in daily service at Stockholm, and has proved eminently satisfactory to the engineers of the city. The results that have been obtained prove that this self-dumping barge is superior to the ordinary hopper type with false bottoms. It is cheaper in first cost and maintenance; can handle rock of practically any size and weight within its total capacity; and is a first-class craft for any harbor transport. If desired, the elevated cylinder can be unshipped in a couple of hours, and the barge used as an ordinary lighter. The system is applicable to any type of barge, whether of the blunt-ended type or one of fine lines. It is only necessary to insure a sufficient breadth to counteract the influence from high winds. The success of the flush-deck type has induced the inventor to extend the idea to craft with sunken holds for handling gravel, mud, and other semi-liquid or soft material, which cannot be accommodated on a flush deck.

HALLEY'S COMET AT ITS BRIGHTEST.

BY HENRY NORRIS RUSSELL, PH.D., PROFESSOR OF ASTRONOMY AT PRINCETON UNIVERSITY.

It may have seemed remarkable to many people that so long a time has elapsed since the first observation of Halley's comet at its present return, and yet it has not shown itself at all to ordinary eyes. The accompanying illustration (Fig. 1) will help to explain this. When first detected last September, with very powerful telescopic aid, it was far beyond the limits of our diagram, at twice the distance of Mars from the sun, and nearly as remote from the earth. At first the two

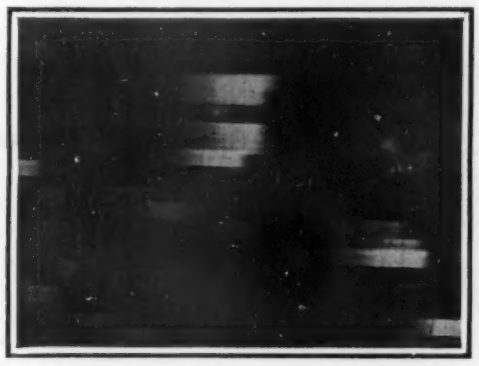


Fig. 4. Spectrum of Halley's comet.

Photographed at the Yerkes Observatory by Prof. Frost, January 14th, 1910. The spectrum of the comet is in the middle between the two brightest star-spectra. See description in text. The blue end of the spectrum is on the right; the ultra-violet on the left.

bodies approached each other rapidly; but before the end of the year our planet crossed the line joining the comet with the sun, and by January 1st, as the figure shows, we were moving almost straight away from it. During the early part of the year the earth and comet passed on opposite sides of the sun, so that it was lost to our view early in March.

About the time that this is printed it will come into sight again, on the other side of the sun, rising before daybreak. But now its path has curved so that it is coming toward us—almost directly, if we take our motion into account as well as its own. It therefore seems to stand almost still among the stars, while growing steadily larger and brighter, so that any one might tell by its mere changes in appearance that it was approaching us rapidly.

Finally, about the middle of May the comet will apparently approach the sun again, and on the 18th it will pass in front of him, literally between us and the sun, transiting the latter's disk. If at this time its tail is more than fifteen million miles in length we will pass through it, as the figure shows.*

The comet's closest approach to us comes two days later, on May 20th, when it is but fourteen million miles away. For a few days following this it will be splendidly visible in the evening sky, and then it will fade gradually as it recedes from us.

It is clear from the diagram that this apparition of the comet is an exceptionally favorable one, for it passes the earth almost at the point where their orbits come nearest to one another. If it had returned only three weeks earlier, it would have come as near as possible—only seven millions of miles—but at this time it would have been directly south of the earth, astronomically speaking, almost over our south pole, and quite invisible from northern latitudes. It therefore appears that the present conditions are almost ideally favorable for observers placed, as we are, north of the equator.

The illustration on the first page shows better than any verbal description where to look for the comet in the morning sky in New York. The moon and Venus

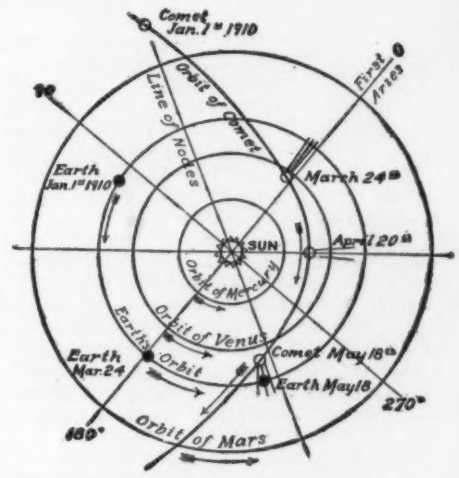


Fig. 1.—RELATIVE POSITIONS OF HALLEY'S COMET, THE EARTH, AND THE SUN.

are shown in the positions which they will occupy about May 1st, when, on the whole, the comet can be seen to the best advantage. At an earlier date, Venus was higher in the sky, compared with the comet. There was less trouble then from moonlight, but the comet did not rise so early—about 4 A. M. on April 15th as against 3 A. M., on the later date.

The comet's brightness when it appears in the evening sky about May 20th will be sufficient to render any finding diagram unnecessary. It will only be needful to look toward the west half an hour or more before the comet sets, which it does at 8:20 P. M. on the 20th, 9:15 on the 21st, and 9:55 on the 22nd, after which it will be clearly visible until after 10 P. M.

Our other illustrations, which appear here through the courtesy of Profs. Frost and Barnard of the Yerkes Observatory, show the appearance and character of the comet earlier in its apparition. Fig. 2 illustrates its extreme faintness at the time of its rediscovery (which was announced by Prof. Wolf of Heidelberg less than a week before the earliest of the four photographs here shown was taken) while it was still 300 million miles distant, both from the earth and from the sun. On any one plate it is difficult, if not impossible, to distinguish the comet from the multitude of faint stars around it, but on comparing the four (which show exactly the same region of the sky) it is easy to see that the stars are the same in all, while the comet is "here to-day and gone to-morrow."

With the great Yerkes telescope (which gives far smaller and sharper images of the stars than can be reproduced on any known photographic plate) the comet was even at this time quite different from the stars in appearance; in Prof. Barnard's words, "a fleck of light surrounded by a faint nebulosity" with no definite boundary. His measures, made on several nights, show that its actual diameter was about 12,500 miles.

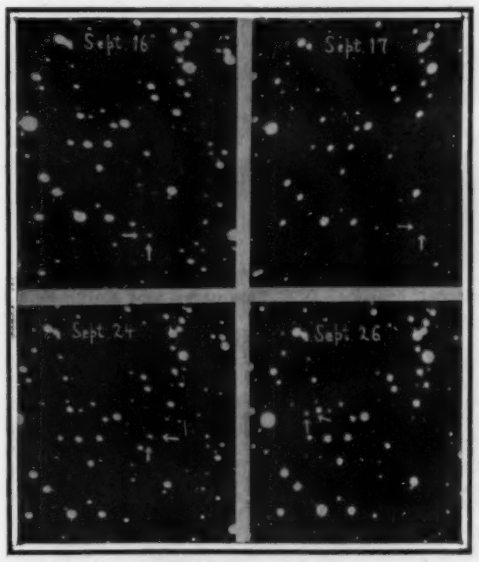


Fig. 2.—Halley's comet at its reappearance in 1909.

From photographs taken by Mr. Lee with the two-foot reflector of the Yerkes Observatory. These four photographs represent the same portion of the sky. The arrows point to the comet which appears like a faint star but moves from night to night.

Our second illustration, from a photograph taken when the comet was 143 million miles from the sun, and 162 million from us, shows it already well advanced in the changes which invariably accompany the approach of any considerable comet to its perihelion. The head of the comet has become larger—not merely in apparent size, owing to its approach to us, but actually in miles, while a faint slender tail, pointed away from the sun, makes its appearance.

As Fig. 1 shows, the tail, which extends directly away from the sun, was at this time also nearly in line behind the head, as seen from the earth, so that its actual length must have been much greater than it appears to be—about five million miles, according to Prof. Barnard.

This considerable development of the tail, while the comet was still at two and one-half times its least distance from the sun, makes it probable that at and after the perihelion passage, on April 20th, it will be much longer, probably long enough to envelop the earth as it sweeps past.

Our third illustration shows the spectrum of the comet photographed on January 14th, when it was about 170 million miles from the sun.

In taking such a photograph, a prism is placed in front of the camera. The light of a star is thus drawn out into a line which, by letting it trail on the plate, is broadened into a band, crossed by the dark lines which tell us what absorbing gases exist in the star's atmosphere. Most of the objects on the plate are the spectra of stars near the comet obtained in this way. The comet's spectrum is near the middle, between the two very broad and conspicuous "comparison spectra," which were produced by supplementary exposures on some bright star, and serve as reference marks to find the position of the lines in the spectrum of the comet itself. The latter, unlike that of the stars, consists

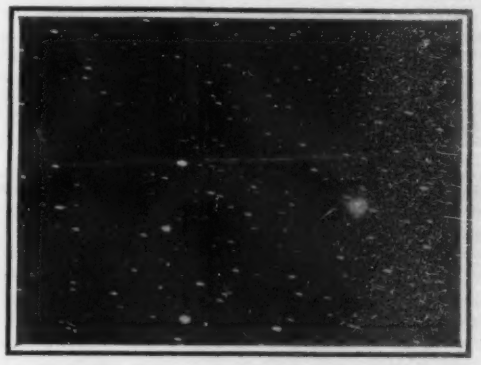


Fig. 3.—Halley's comet on February 3rd, 1910.

From a photograph taken at the Yerkes Observatory by Prof. Barnard. As the instrument was kept pointed at the comet during the exposure the stars appear as short streaks. The actual length of the comet's tail is about five million miles.

mainly of bright bands or lines, three of which are conspicuous. The brightest of these, as is shown by comparison with the hydrogen lines of the comparison spectrum, is the so-called "cyanogen band" at the extreme violet end of the visual spectrum. The others are probably, as in the case of other comets, also due to gaseous compounds of carbon.

Between these bright bands can be seen a faint continuous spectrum, due to reflected sunlight.

When the comet first appeared, the photographs made at the Lick Observatory showed this continuous spectrum alone. At that time it must have been shining entirely by reflected light; but by the date of our illustration it had already begun to be self-luminous. This is corroborated by the fact that its brightness increased much more rapidly than could be explained by the mere increase in the amount of reflected light, due to its approach to the sun and to us.

This intrinsic light of the comet, as its spectrum shows, is given off by luminous gas; but we do not yet know what makes this gas shine. It can hardly be high temperature, for the comet had just come from the depths of interplanetary space, and did not yet receive nearly as much heat from the sun as the earth does. It must, however, be due to some kind of solar action, for it increases very rapidly as a comet approaches the sun. We can reproduce the same spectrum in the laboratory by passing an electrical discharge through a vacuum tube containing compounds of carbon and nitrogen at very low pressure.

It is of special interest that, even if the carbon compounds form but a small percentage of the gas in the tube, their spectrum becomes relatively prominent when the pressure is made very small, say 1/100,000 of that of ordinary air. It may be, therefore, that at the lowest pressures, carbon compounds have an exceptional capacity for shining; and it would be unsafe to conclude that they are the principal gaseous con-

* Prof. Barnard has informed us that the tail was 14,000,000 miles long on February 27th, from which it may well be inferred that it is much longer than 15,000,000 miles now.—ED.

stituents of the comet, because they give off almost all the light.

It may be added that the "cyanogen" bands in the spectrum are produced, not only by the poisonous gas of that name, but in all cases when carbon and nitrogen are together under electrical excitement. For example, they are very strong in the spectrum of an ordinary arc-light, where the nitrogen comes from the arc, and the carbon from the terminals. It would be about as reasonable to conclude that an arc-light was poisonous, after looking at it through a spectroscope from a distance, as to make the same deduction about a comet.

Whatever may be the origin of this intrinsic light of comets, it is responsible for most of the phenomena which make them of general interest, for almost all the light of the tail, as well as of the head of a bright comet is of this kind. If Halley's comet shone by reflected sunlight alone it would be barely visible to the naked eye, even under the most favorable circumstances.

Actually, owing to its intrinsic light, it has been a conspicuous object at every return for the last 2,000 years. The only gap in the record—in A. D. 912—has lately been filled by the discovery of unmistakable references in old Japanese chronicles.

The actual quantity of matter composing it must, however, be very small as compared with the more familiar heavenly bodies. It is possible to form a rough guess as to its amount by considering the amount of light which it reflects when it is not shining on its own account. From the estimates of magnitude made last September, it appears that a single body only a little over 30 miles in diameter at the distance of the comet would have sent us as much reflected light, provided that its reflecting power was equal to that of the moon, which is lower than that of most of the planets.

It is, therefore, clear that the comet must be composed of separate particles widely separated. The whole cross-section of the comet (12,500 miles in diameter) is about 120 million square miles; while the total area of all the reflecting particles, according to the above estimate, is about 1,000 square miles. A ray of sunlight falling on it has therefore less than one chance in 100,000 of being stopped, and all the rest of getting through some empty space. It is no wonder that comets are transparent, and that stars can be seen through them! If we only knew how big these particles were, we could now estimate their number and their total mass. But here we are quite in the dark. As the light of the comet seems uniformly diffused and it shows no signs of resolution into points of light, the number of particles composing it must at least be counted by thousands. Their average diameter must therefore be less than a mile, though they may vary enormously in size. If all gathered into one compact group, they could at most hardly exceed in bulk the satellites of Mars or the smallest of the asteroids.

But how much smaller than this limit their actual dimensions may be, we do not know. If, purely for illustration, we suppose that they average an inch across, there would be some five or six million millions of them. This sounds like an enormous number, but if we calculate the bulk of the comet, we find that there would be only five or six particles per cubic mile of space, on the average, inside it. Near the center they would doubtless be more closely packed, and more thinly toward the outer parts of the comet. The combined bulk of all these particles would be about 80 million cubic yards—a large amount from the engineering standpoint, but not equal to the quantity of water which falls within the limits of the smallest State in the Union during a heavy rainstorm.

This may serve to give us some idea of the extreme tenuity of the comet as a whole. If we took a space as big as the comet, that is, half as much again in diameter as the earth, and sowed ordinary golf balls through it at the rate of two or three per cubic mile, leaving the intervening space absolutely vacant, we would get something that would look quite as bright as Halley's comet—if put alongside it when it first appeared.

The gaseous matter, which gives most of the light at perihelion, probably oozes out of the solid particles as these grow warm under the sun's heat when they approach it. As the gas becomes luminous under solar action, the brightness of the comet increases, and its outer regions, originally invisible because the number of reflecting particles was too small to influence our eyes, gradually come into view.

Some of this is repelled from the head of the comet, by little-known forces, and driven away from the sun by the action of the sunlight, which, as is well known, exerts a force of repulsion which, if a particle is exceedingly small, as are the gaseous molecules, is stronger than the attraction of the sun.

Thus arises the long and magnificent tail, which, like the smoke-trail of a steamer at sea, is ever being renewed at one end and fading away at the other, even though it seems to accompany the comet in its journey. As the comet recedes from the sun, much of this gaseous matter has thus been lost, never to be regained. Some of the remainder probably condenses round the solid particles when they become cold, and some escapes into space.

The comet is thus gradually losing its substance, and in the course of ages it may be deprived of all its tail-forming material, and lose its former glory. This seems to have actually happened to some of the short-period comets, one at least of which has disappeared altogether.

Halley's comet is perhaps preserved from such a fate by the longer interval between its returns to the region near the sun, where its activity takes place. It may be, too, that it has more of the right sort of material to spare for a tail. But the time may come when most of this is lost, and its successive appearances may gradually lose those impressive features which have so long inspired awe and wonder in the hearts of mankind, and dwindle at last into something which the professional astronomer alone will be interested in watching.

The Mercury Vapor Lamp and Its Effect on the Eye.

About a year ago we published a reference to a report of Prof. J. Norman Collie, F.R.S., stating in effect that a German medical journal had described certain cases of alleged injury inflicted upon the eyes by rays of mercury vapor lamps. These cases referred to all prove to have resulted not from the mercury vapor illuminating lamp, which is now so largely in use in this country and which is constructed with a tube or container of glass, but from a special lamp used in medical, sterilization, and chemical processes, having a quartz container. The medical or sterilizing lamp, to be sure, uses mercury vapor, but its container being of quartz, it is transparent to those rays which may be injurious to the eyes, while glass is opaque to such rays and does not permit their passage. The quartz lamps referred to by Prof. Collie are intentionally made to emit germ-destroying rays. Dr. Charles P. Steinmetz, who has made a careful study of mercury vapor lamps used for illuminating purposes, stated in an article in the Electrical World and Engineer of February 21st, 1903, as follows:

"The mercury arc, therefore, is the only known artificial illuminant which is perfectly harmless, and thus especially suited for use where accurate work has to be done by artificial illumination, as in drawing rooms, offices, factories, etc."

The same scientist in an article in the Daily Union, Schenectady, N. Y., on January 17th, 1903, stated as follows:

"Therefore electric lights are less harmful than gas or oil lamps, being whiter, and the white daylight the least harmful, while the mercury arc light which is entirely devoid of red rays, is absolutely harmless, and a person can look straight into one of these mercury arcs of enormous brilliancy without being blinded by it."

In one of Dr. Steinmetz's books entitled "Radiation, Light, and Illumination," he makes the following statement:

"The harmful effect of working very much under artificial illumination is largely due to its energy effect, incident to a large amount of orange, red, and especially ultra-red in the radiation of incandescent bodies used for illuminants and thus does not exist with 'cold light,' as the light of the mercury lamp."

The Current Supplement.

Prof. R. F. Ruttan writes most interestingly in current Supplement No. 1789 on the manufacture of alcohol from sawdust and other wood waste. A novel type of automatic stamp-vending machine is described and illustrated. Prof. Charles Edward Lucke writes on the development of power systems. Prof. Otto N. Witt's paper on fast and fugitive dyes is concluded. Harlan I. Smith presents some curious information on the wooden monuments of the Northwest Coast Indians. A biography of the famous Dmitri Ivanovitsch Mendeléeff is published. A method of instantaneous microphotography is described.

Official Meteorological Summary, New York, N. Y., March, 1910.

Atmospheric pressure: Highest, 30.51; lowest, 29.47; mean, 30.8. Temperature: Highest, 78; date, 29th and 30th; lowest, 24; date, 18th; mean of warmest day, 64.5; date, 25th; coolest day, 32; date, 15th; mean of maximum for the month, 52.4; mean of minimum, 37.0; absolute mean, 44.7; normal, 37.5; daily excess compared with the mean of 40 years, 7.2. Warmest mean temperature of March, 48, in 1903; coldest mean, 29, in 1872. Absolute maximum and minimum of March for 40 years, 78 and 3. Average daily excess since January 1st, 3.5. Precipitation: 0.86; greatest in 24 hours, 0.26; date, 1st and 2nd; average for March for 40 years, 4.10. Deficiency of this month compared with normal, 3.24. Accumulated deficiency since January 1st, 1.09. Greatest precipitation, 7.90, in 1876; least, 0.86 in 1910. Wind: Prevailing direction, northwest; total movement, 7,983 miles; average hourly velocity, 10.7; maximum velocity, 44 miles per hour. Weather: Clear days, 13; partly cloudy, 13; cloudy, 5; on which 0.01 or more of precipitation occurred, 6. Snowfall, 0.4. Mean relative humidity, 68.3. Dense fog, 2nd, 3rd. Sunshine, 69.2.

The Highest Dam.

At the hour of two in the morning of Sunday, January 16th, the completion of the Shoshone dam in Wyoming was announced. This is the highest dam in the world, being 328.4 feet from the base to the parapet. It is located in the profound canyon of the Shoshone River, in one of the wildest and most picturesque regions of northern Wyoming. The walls of the gorge are nearly perpendicular, and rise nearly 2,000 feet above the stream. At its base the dam is 70 feet across; on top it is 175 feet in length, and at the base the dam is 108 feet wide.

The completion of this dam creates an enormous reservoir, having a surface area of ten square miles and an average depth of seventy feet. The capacity of this irrigation basin in gallons is something like 148,588,512,000. The construction of this great dam was attended with difficulty from the beginning, owing partly to the inaccessible section in which it stands.

The dam is to control for all time the great floods of the Shoshone River and to provide an ample water supply for the irrigation of more than 100,000 acres of exceptionally fertile land in the valley below, a portion of which is now available for settlers under the terms of the reclamation act.

The contract for the Shoshone dam was let September 18th, 1905, to a Chicago firm for $515,730. This firm, however, defaulted, and the work was completed by another contractor.

Rail-Cleaning Car.

When streets are cleaned by sweepers, whose brushes push the dirt before them, the dirt is swept into the grooves of the street railroad rails and then compacted by the wheels of the running cars. The rails so coated with dirt offer a greater resistance to the electric current, thereby causing a greater amount of power to be used for the propelling of the cars. The rails must be constantly cleaned to avoid loss of current.

The Hanover Street Railway Company has built for this purpose a special rail-cleaning car. It is similar in construction to a regular two-axle car, and has two 25-horse-power motors. Between the front and rear wheels on both sides of the car are steel brushes, which loosen the dirt from the rails. This dirt is automatically removed by a vacuum pump, and deposited in a box built into the lower part of the car between the axles of the driving wheels. The vacuum pump is operated by an electric motor attached to the dirt box. To avoid the raising of dust in dry weather, a sprinkler and two tanks, holding about 925 gallons of water each, are provided.

As soon as the box is filled, an automatic alarm notifies the motorman, who shuts off the pump, raises the brushes, and takes the car to a place where it can be emptied and made ready for another trip.

This car can be run at any rate of speed allowable in street traffic up to 17½ miles per hour, and still will work with good results. It can be run by one man, and the amount of power used at a speed of 10 miles per hour is only about 3,000 volts per mile. The car can clean daily an average of 45 miles of track, using according to weather conditions, up to 132 gallons of water and taking up to one cubic yard of dirt per mile of track.

Death of Thomas A. Baxendale.

The founder of the box toe industry in this country, Mr. Thomas A. Baxendale, died at Brockton, Mass., on April 1st at the age of seventy. A native of England, Mr. Baxendale came to Brockton in 1867 a poor man. The shoe industry was then in its infancy. He entered one of the large factories and invented the box toe which is now used in nine-tenths of the shoes that are worn. Later, with John Simmons as a partner, he founded the firm of T. A. Baxendale & Company. He invented many machines for producing shoes, most of which are now in common use. He died a wealthy man.

Death of Thomas B. Jeffery.

Mr. Thomas B. Jeffery, who invented what is known as the clincher pneumatic tire, died on April 3rd, at Pompeii, Italy. He was for more than twenty-five years a partner of the firm of Gormully & Jeffery, makers of bicycles. English by birth, he came to this country at the age of eighteen, and settled in Chicago. He took an active interest not only in the development of the bicycle, but in the automobile as well.

Death of Paul Theodore Sievert.

Paul Theodore Sievert died January 11th, 1910, in Dresden. He was a well-known German manufacturer and inventor. He is best known for an invention in which he applied compressed air for blowing vessels of glass of any desired size.

Correspondence.

WANTED—A RICE HULLING MACHINE.

To the Editor of the SCIENTIFIC AMERICAN:

Whoever will invent a machine to hull rice, will be as great a benefactor to the rice farmer and the consumer as Eli Whitney in the invention of the cotton gin. The farmer often gets 75 cents per hundred or less for his raw product, and generally has his crop in the mill for months before he gets this. The mills are huge structures because of the necessity for large storage; but the real mill part of the plant is about the same in machinery as a flour mill. The main processes are two, the removal of the hull and the removal of the polish. The former is accomplished by burr stones, but the grain passing from under these is not completely clear of the hull. The next process is accomplished by a cylinder of wire cloth containing a revolving core of sheepskin with the wool on, which takes off the remaining hull and the outside of the grain as well. The native French of Louisiana prepare their rice by means of a wooden pestle, which removes the hulls and leaves the polish, the most nutritious part of the grain. Usually the mills have an arrangement for coating each grain with paraffin, but this is not even an improvement except in appearance.

Whoever will invent a small machine, say in size similar to a farmer's fan mill, that will remove the hull from the grain, will remove the rice crop from the enormous toll now paid the miller, and give a cheap and healthy food to the people as a superior substitute for the present rapidly ascending foodstuffs to which we have been accustomed. There are large investments in the milling of the crop, but it ought to be a paying investment with $9.75 profit between the planter and the consumer on each 75 cents received by the farmer. C. W. CAMPBELL.

Johnston City, Ill.

THE EFFECT OF REFRACTION ON THE TRIANGULATION OF MOUNTAIN SUMMITS.

A REPLY TO MISS PECK'S STATEMENTS IN THE PRESS.

To the Editor of the SCIENTIFIC AMERICAN:

Since the announcement by Mrs. F. Bullock Workman of the results of the recent scientific and carefully executed measurement of the two summits of Mount Huascaran by the professional engineers sent out to Peru by her from Paris, Miss A. Peck has favored the press with communications, the evident purpose of which is to bolster up her assertions not based on any measurement data as to the height of that mountain by attempting to discredit the figures obtained by triangulation, the most accurate method of measuring altitude known. To effect this the communications contain a quotation and two statements, one of the latter absurd and self-contradictory in its terms, so brought together as to tend to befog the mind of the reader and lead him to infer that in general the results of triangulation of a mountain summit by an expert engineer are likely to be vitiated to an extent of 4,000 feet by refraction.

The quotation from Mr. Mumm and the statement attributed to Dr. Collie, the one a publisher and the other a chemist by profession, neither of whom, so far as I know, has ever claimed to be an expert in altitude measurements, merely repeat in general terms what is well known to engineers, that no method of determining the exact amount of refraction having been yet discovered, the present heights of certain high mountains obtained by triangulation may be somewhat changed, either higher or lower, should such method be discovered in the future. Such change would probably not be great in any case, and in many cases would be very slight, varying from nothing to a few feet, for no coefficient of refraction that is likely to be used would greatly alter the results now obtained.

Between the recognition of the fact that figures obtained by triangulation may not now be absolutely, though they are essentially, accurate, and the ridiculous statement asserted by Miss Peck to have been made by a nameless friend of a so-called "former member of the British Royal Engineers" that he triangulated the great peak K-2 and obtained a height 4,000 feet greater than that now assigned to it by the Indian Survey, which impossible difference Miss Peck would have the public believe is due to refraction, there is an impassable gulf.

The possible discovery of an absolutely accurate method of determining refraction would affect chiefly the present altitudes assigned to certain very high Himalayan peaks, such as Mount Everest, which were triangulated from very distant points low down in the Indian plain, and to a less degree some other high peaks also measured from distant stations. At the discussion of a paper on mountain exploration read by me before the Royal Geographical Society in London in November, 1907, Sir Thomas Holdich, one of the most eminent living English engineers, for many years as a member of the Survey of India engaged in Himalayan surveying, speaking of the very highest mountains said: "We do not know exactly, and at present there is no means of determining, what the exact effect of refraction may be in those altitudes; . . . and the result of variation when applied as correction to those observed trigonometrical altitudes may be considerable." To show what he judges to be considerable may be added his further remark, "Mount Everest will probably prove to be some hundred feet or so higher than we at present reckon it."

Observe that Sir Thomas considers one hundred feet in 29,002, the present height assigned to Mount Everest, a considerable change in the altitude of that peak, which is the most extreme case of all on account of its great altitude, its distance from the measuring stations, and the large amount of moisture in the air above the hot, steamy plain of Bengal. He does not for a moment entertain the figure of 4,000 feet said to be suggested by the friend of the British Royal Engineer. If Sir Thomas's estimate be a probable one in this case, in the more favorable ones of lower summits measured from near stations the amount of correction would shade down nearly or quite to zero.

Now Miss Peck supposes an allowance similar to the friend of the Royal Engineer's 4,000 feet made to the ascertained height of Huascaran, and asserts, "it might easily happen that the mountain is one or two thousand feet higher than it has been figured," which would bring it up well toward the altitude she has estimated it at. Such a supposition is not tenable. Even if the 4,000-foot statement regarding K-2 were true, the conditions in this case are entirely different. Her plan is ingenious but not creditable to her knowledge of the principles of altitude-measurement. Suppositions have no place in this field. Observed facts are what count.

M. de Larminat and his assistants, who are expert engineers and know what they are about, triangulated the two summits of Huascaran from four accurately measured stations at an altitude of 12,500 feet, in the immediate neighborhood of that mountain, in perfectly clear weather. Here was no immense distance, no haze in the air, no great height of the summits above his stations, as in the case of the great Himalayan peaks mentioned, to cause any appreciable chance of error due to refraction. Refraction in this case, if not allowed for at all, would be practically a negligible quantity. His results determined from four stations, three being usually considered sufficient to insure accuracy, must be exact to within a very small figure. Prof. Fr. Schrader and M. Henri Vallot of Paris after a careful personal examination and checking of all M. de Larminat's observations and calculations have indorsed them as correct. The indorsement of engineers of such worldwide reputation as they have is a sufficient guarantee of the accuracy of the work. Miss Peck may therefore rest assured that this triangulation will be accepted by engineers and experts as accurate and definitely settling the question of the altitude of the two summits of Huascaran.

Miss Peck makes two other statements, the relation of which to the altitude of Huascaran is not apparent: (1) That I "improperly claimed" a world record with 23,394 feet; and (2) that Mr. Graham's ascent of "Mount Kabru, about 24,000 feet, twenty years earlier, is now quite generally acknowledged." Mr. Graham, on his return from the Eastern Himalaya, claimed to have nearly ascended Mount Kabru as well as to have made a number of other high ascents. He gave an account of his experiences, in London. His claims were very generally disbelieved at the time and afterward by mountaineers and engineers, and were especially disputed by the Indian Survey, the members of which were in a particularly advantageous position to judge of their truth. The grounds for discrediting his ascent of Kabru were several, but the strongest of all, well known to the Survey officials, has never, I think, been published, as the Survey did not enter the lists in print against Mr. Graham. Within two years I have had the opportunity of discussing the question with a retired surveyor general of the Indian Survey, who was in Calcutta when Mr. Graham returned from his attempt on Kabru, and he expressed his disbelief in the strongest terms.

Some time after the event Mr. Douglass Freshfield advocated Mr. Graham's claim, bringing forward no new evidence beyond Mr. Graham's original account, but basing his opinion on certain considerations of probability, which though specious were not conclusive and did not convince the public. He stood nearly alone for years. Recently a few of his friends have expressed their concurrence in his opinion, and in the United States Mr. E. S. Balch and Miss Peck have echoed the cry, though neither of them can have any knowledge of the question that can make their opinion regarding it of any value. The world at large has remained either neutral or disbelieving.

It is noteworthy that Mr. Graham had no instruments, not even an aneroid, with him by which to determine the altitudes he claimed to have reached, so that, as in Miss Peck's case, his ideas as to his altitudes were based wholly on guesswork. It is also significant, as an English journal recently stated, that after his account given in London, he never joined in the discussion that followed nor attempted by any further statement to defend his claim. Not long afterward he disappeared, and, so far as I have been able to learn, his whereabouts have since remained unknown.

Mr. Graham's account constitutes the only evidence available in the question. If anyone after reading this chooses to believe that his claim to have ascended Kabru is valid, he has a perfect right to do so, but such belief does not afford any proof of validity, nor does it warrant the person holding it in asserting that Mr. Graham's ascent "is now quite generally acknowledged." The only verdict that can be reached, as the matter stands, is that of unproven.

In stating the above facts I wish it distinctly understood that I am not expressing my own opinion as to Mr. Graham's claim. This I have nowhere done either in lectures or in writing, although such expression has been ascribed to me by others.

With regard to Miss Peck's repeated assertion that I "improperly claimed" a world record with 23,394 feet, my position may be stated as follows: Although, as a matter of fact, this altitude, attained by me in 1903, was and remained for several years the highest measured altitude reached on an ascent, and although I had every right to publish it to the world as a record, with two exceptions I have never mentioned it as such either in public or in print, not even in the volume "Ice-Bound Heights of the Mustagh," by Mrs. Bullock Workman and myself, in which I have described my ascent to that altitude. One exception was a mention of it in one of the issues of "Who's Who?" The other was in connection with a paper on that ascent read before the Alpine Club in London in May, 1905, when I said:

"The word 'record' in the title of this paper is used as referring to the highest substantiated ascent yet made in mountaineering. The contention that Mr. Graham reached an altitude of 24,000 feet has, on various grounds, whether rightly or wrongly, been so strongly disputed that it must be regarded as far from proved, and therefore the altitude mentioned cannot properly claim a place among those acknowledged to have been made."

In this year 1910, so far as Mr. Graham's claim is concerned, I see no reason to alter a word of that statement.

In view of the above I do not think it would be courteous in me to deprive Miss Peck of the distinction of "improperly claiming" a world record, in which she herself has enjoyed a monopoly for the last two years. During that time her chief appeal to the interest of the public has been not by scientific observations on natural phenomena at high altitudes, but by constant reiteration in the press, without the authority of any measurement proof, of claims to the attainment of an altitude variously stated at from 25,000 to 23,000 feet, which finally crystallized into "It may be regarded as certain that Huascaran is above 23,000 feet. . . . If, as seems probable, the height is 24,000 feet, I have the honor of breaking the world's record for men as well as women."

Mrs. Bullock Workman's engineers have now stripped her claim of all ifs and probabilities and brought it definitely down to 21,812 feet, the altitude of the lower summit of Huascaran she claims to have ascended. WILLIAM HUNTER WORKMAN.

Algiers.

Effect of Rainfall on the Cotton Industry.

The amount of rainfall and the development of the cotton industry, in any region, are intimately connected. The first proof of this rather surprising assertion is found in the continual endeavor of inventors to devise means of giving to the air of cotton spinning rooms a proper and sufficient degree of humidity. But a deficiency of natural humidity cannot be perfectly remedied by artificial means, and it is a fact well known to all cotton spinners that the product of the spindles is considerably increased by the constant presence of a large amount of moisture in the air. The moist climate of Normandy has made that province the chief seat of the cotton industry in France, and for a similar reason Manchester has become the center of the English cotton manufacture. In addition to a moist atmosphere, the cotton industry requires abundance of water in its visible form. Cotton mills are always located on or near streams and are provided with capacious reservoirs.

Hence the great diminution in the rainfall of the Manchester district which has taken place within the last half century is a valid cause for alarm. Hesketh has collated the records of rainfall made between 1860 and 1908. He finds that the mean annual rainfall was 36 inches between 1860 and 1886, but only 27 1-3 inches between 1886 and 1908. The observed shifting of one of the branches of the Gulf Stream is suggested as a possible cause of this great decrease in rainfall, which threatens the industrial prosperity of Manchester and the surrounding district.—Cosmos.

THE DISINFECTION OF RAILWAY CARS.

The running of a railroad in Germany is evidently accompanied with unpleasantness, if one may judge from the accompanying photographs. The Potsdam shops, which are responsible for the proper maintenance of rolling stock, have been confronted with the difficult task of disinfecting the cars. It seems that the coaches which return from Russia are literally a-swarm with vermin. Even after the cars had been cleaned with true Teutonic thoroughness, there was still the possibility that living disease germs might lurk in the walls and hangings. It was therefore the practice for some years to take down all the upholstery, curtains, etc., and to clean everything thoroughly. Naturally, the expense involved was heavy, and the cars were withheld from service for a considerable time. Moreover, there was also the danger of infesting the shops and other cars.

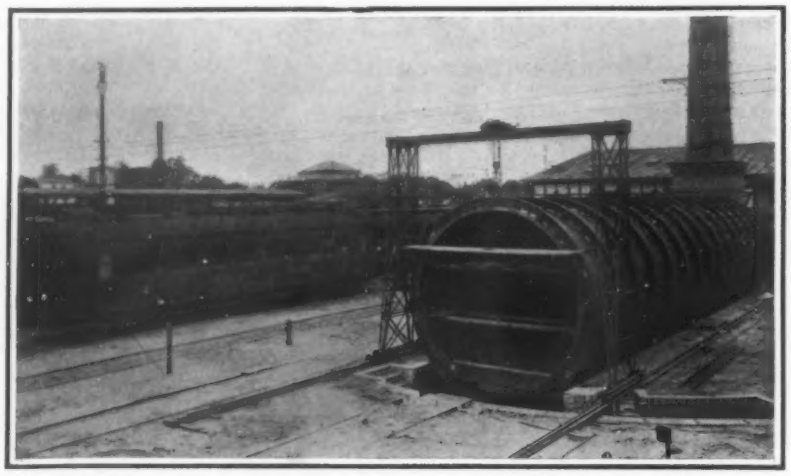
The problem seems to have been successfully solved by Julius Pintsch, who applied to the railway car a principle of disinfection which has been successfully employed on vessels. His disinfecting apparatus consists of an iron cylinder built up of cast-iron annular sections, of 16 feet internal diameter. The inside length is about 72 feet. The cylinder is so stoutly constructed that it can easily support without deformation a 30-ton car.

During disinfection the air within the cylinder is considerably rarefied by a pump, and as a result, the outer air exercises a pressure of about 1,900 tons on the disinfecting cylinder. Since the apparatus is heated during disinfection, allowance has to be made for expansion. Hence the cylinder is mounted upon rollers, so that the apparatus can yield to an extent of about three-quarters of an inch in length, which is the amount of expansion.

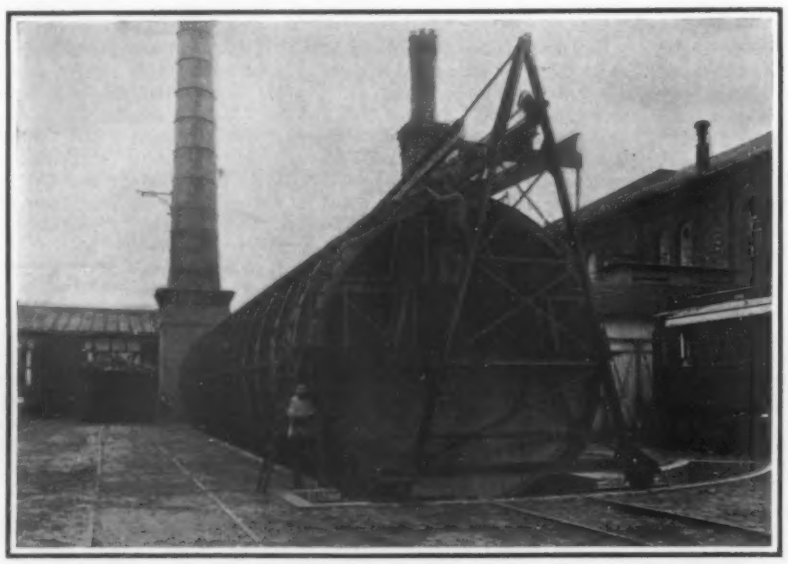
Before it is run into the cylinder, all the windows and transoms of the car are opened. By means of a crane a two-ton closure is brought against the open end of the cylinder. A rubber gasket is employed to make the closure hermetic. Huge bolts hold the closure, gasket, and cylinder together. Steam is blown into the interior of the cylinder. Two hundred and fifty steam pipes line the interior of the cylinder, all receiving their supply from the main pipe. The total length of all these pipes is about 1¾ miles. In order to heat the air within the cylinder quickly and uniformly, two blowers are set in motion, so that all the air is brought in contact with the heating tubes. Even during the coldest weather the temperature within the cylinder can be raised to 140 deg. F. in from one to two hours. In order to heat an entire coach to this temperature, about five hours is required. After the car has reached the proper temperature, the air is pumped out of the cylinder until a vacuum of 70 to 74 centimeters of mercury under the normal pressure is obtained. At this atmospheric pressure water will boil at 104 deg. F. Hence all moisture is evaporated from the car without injuring the parts by the excessive heat. In no other way is it possible to kill vermin effectually. The upholstery, curtains, hangings, etc., are not in the least injured.

For very special purposes the cars may be disinfected with formaldehyde gas. At the very first attempt, a car was thoroughly purged of vermin. To make assurance doubly sure, and to test the efficacy of this formaldehyde disinfecting method, a glass vessel full of the living insects had been purchased from a professional vermin-exterminator in Berlin. This vessel was placed in the car and covered with cotton and linen. The insects were all killed.

The apparatus has also been employed to dry out wet cars, as well as cars pervaded with the unpleasant odor of cooking. After twenty-four hours they were quite ready for service again. In this case no formalin was used.



The huge cylinder in which German railway cars are disinfected by steam and formaldehyde at Potsdam after their return from a trip to Russia.



Sealing the cylinder with a two-ton gasketed closure before exhausting the air and turning on the steam.

Liniment for Burns.—40 parts sugar lime, 10 parts glycerine, 30 parts carbolic acid oil, 3 parts salol.

GOVERNMENT IRRIGATION IN THE YAKIMA WATERSHED.—THE TIETON CANYON CANAL.

BY DAY ALLEN WILLEY.

The region adjacent to the Yakima River in southern Washington is the location of a group of irrigation projects which are notable for the engineering features. The topography of the country reveals a number of areas of arid land, separated by hill ranges which prevent water being distributed from a single source of supply. The engineers of the Reclamation Service have made an investigation which extended from the lower portion of the Yakima River to its head waters in the foot hills of the Cascades, and have planned five reservoirs and distributing systems, which will have a capacity to irrigate no less than 350,000 acres, making this group of projects one of the most important in the West. The various works are the Tieton, Sunnyside, Wapato, Kettitas, and Benton. They have a water supply through the rivers from four lakes and a submerged "meadow" having a total area of 574 square miles.

While the lower section of the Yakima River is used in part for what is known as the Sunnyside project, most of the service is performed by the Tieton, the Naches, and the Cowiche streams—small rivers which are feeders of the Yakima.

Of the projects, the Tieton is most interesting from a scientific standpoint, owing to the difficulties along the route, the various applications of power, and the fact that without the use of concrete the project would have been impossible. This stream flows through a deep canyon with very steep sides, the height of the bluff ranging in places as high as 400 feet from the bed of the river to the level of the canal. The water of the Tieton is diverted by means of a concrete dam thrown across the stream. Although but three feet high and 200 feet long, the reservoir thus made is sufficient to fill a main canal 12 miles long and lateral canals having a total of 51 miles. In conveying the water from the dam to the point of distribution, the only practical route which could be located was largely along the side of the canyon near the top, the rim being of such formation that it would be impossible to build a tunnel or open canal upon it. Consequently, several miles of the conduit were supported upon hinges or arms of reinforced concrete anchored into the rock and extending outward from the canyon side. The Tieton project contemplates the irrigation of from 24,000 to 30,000 acres of land in the vicinity of North Yakima, Wash.

As the water is conveyed along the precipitous side hill of the Tieton canyon, for 20 per cent of the distance the canal lies in tunnels. The open canal sections are of semicircular form, 8 feet 2⅝ inches in diameter, with concrete shell 4 inches thick, while the tunnel sections are of circular form, 6 feet 1¼ inches in diameter, with concrete shell 4 inches thick. This canal and tunnel lining are made up in 2-foot lengths, manufactured on the flats along the river bank, where concrete ingredients are readily obtainable, and lifted to the canal line by cable hoists operated by electric power. These hoists are used successively at points about two miles apart, and the concrete shapes are transported along the canal between hoists on railroad tracks laid in the bed of this excavated route.

This plan was adopted for the reason that beds of sand suitable for concrete were found in the bottom of the river. In fact, the Tieton valley was made the site of a novel concrete works. The question as to how to transport them to the work was answered by the use of electrical power. A series of tramways were built at convenient points up the side of the canyon operated by cable hoists. These hoists in turn were served by a series of electric motors securing current from a power station constructed for the purpose. The concrete as fast as mixed was molded to the proper dimensions in portable molds mounted on wheels, so that they could be drawn from place to place. After hardening had taken place, the forms were set upon trucks having sides of steel framework. These trucks were mounted on the tramway, and the material hauled to the top ready to be set in place.

On the Tieton project 10,000 feet of tunnel were necessary, divided into two sections of 3,000 feet each and one of 4,000 feet. In excavating these much of the formation was found to be of black basalt rock requiring special machinery to remove it. In making the tunnel excavation a circular bore 7¼ feet in diameter was driven by machine drills. Tieton River has a fall of from 50 to 60 feet per mile, and advantage was taken of this to develop the power required for operating drills and other machinery and for lighting purposes. A power canal 3,500 feet long, of 180 second-feet maximum capacity and 34 feet effective head, has been completed, which supplies water for operating a Franklin air compressor capable of compressing 1,250 cubic feet of free air per minute to a pressure of 105 pounds per inch, a Westinghouse generator of 120 kilowatts capacity, and one set of 26-inch twin turbines.

About 500 horse-power is developed, ample to operate the six electric drills, six air drills, shop machinery, pumps, hoists, etc., and to light all the camp buildings. The turbine is regulated by a governor, and the power canal is provided with an ample automatic overflow, just below the power house. An electric transmission line, carrying 2,300 volts, has been constructed to the upper portal of Trail Creek tunnel, a distance of seven miles. Electric drills are being operated at the two portals of Trail Creek tunnel, and at the upper portal of Tieton tunnel. At the lower portal of Tieton tunnel, and at both portals of North Fork tunnel, air drills have been installed.

Another difficulty in the way of building the Tieton project was the crossing of a number of ravines carrying small streams. A part of these were diverted into concrete flumes, while other conduits for them were made from rubble masonry. These culverts are of the arched type and vary in width from two feet to eight inches, the size of the larger ones being necessary in order to allow for the flood currents through the ravines. The total expense of completing the

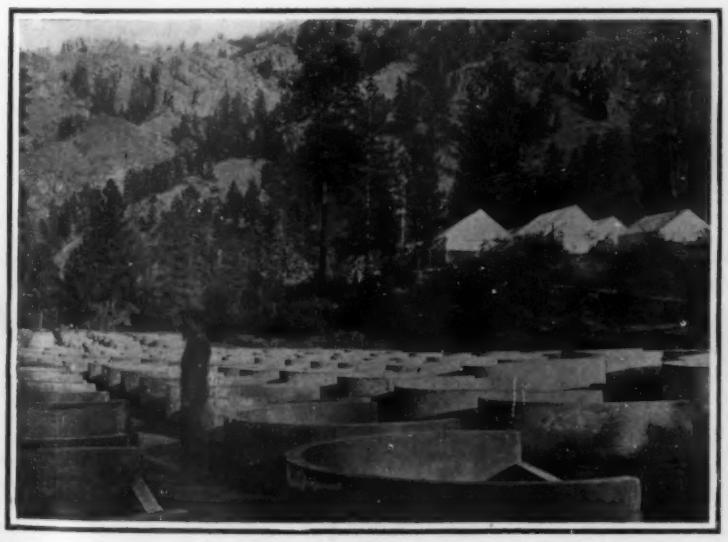
Tieton project is very small considering the work which had to be performed and the acreage which will be served by the water, a tract which will aggregate about 30,000 acres in all. In the construction work it was necessary to have a telephone line 33 miles in length, wagon roads along the route of the canal, and tunnels as well as temporary settlements for the workmen in the valley and on the rim of the canyon. The land, however, is especially suited to the raising of forage, fruit, and hops and is located on three important railroad lines having connections with the principal cities of Washington.

The canal consists alternately of open semicircular concrete conduits and circular tunnel.

Building the open section of the Tieton conduit. Note the wooden forms for the concrete.

One of the portable molds used in forming the concrete facings of the conduit.

The molding yard, showing the concrete lining sections ready for delivery at the canal.



The 4-inch concrete lining was built in sections in the valley and lifted to place on the side of the canyon.

Side-hill excavation for the Tieton canyon canal.

GOVERNMENT IRRIGATION IN THE YAKIMA WATERSHED.—THE TIETON CANYON CANAL.

Ointment for Burns.—Iodoform, 80 parts; extract of conii, 40 parts; carbolic acid, 1 part; rose unguent, 600 parts.

To those of us who served in the Spanish war, and had the canned or corned beef served us as a part of the regular ration, the news will not come as a surprise, but the man who reads this will undoubtedly think of the good beef he gets at home and wonder why complaints should be made.

One particular reason why the army will now use corned beef is from the point of economy, for as mentioned before the price of bacon has so increased as to make the change desirable.

The garrison ration is steadily increasing in price because of the general rise in the cost of food products. When the estimates for army subsistence were made last May for the next fiscal year, it was assumed that a ration would cost 20.97 cents. By January of this year the cost had increased to 22 cents, making it necessary for the War Department to submit a deficiency estimate to Congress. If the present rate of increase keeps up, the cost will be nearly 23 cents by the end of the next fiscal year. When it is considered that the army annually consumes several millions of rations, it will be seen that an advance of even a fraction of a cent in a single ration means a big advance in the aggregate for a year.

Increased Cost of Army Rations.

The numerous published accounts of high prices of food and the hardships which have been inflicted upon the workingman, and also the fact that hog meat has become so high in price that its use has been almost prohibitive, has resulted in a complaint from our Uncle Sam, to the effect that his army would have to substitute corned beef or corned-beef hash for bacon.

HOW GAMBLERS CHEAT.

BY HEREWARD CARRINGTON.

Games of chance have always had a fascination for all classes of individuals, at all ages, and the professional "sharp" has made this weakness (which in some persons is developed into a ruling passion) a means for earning an easy livelihood, at the expense of the numerous "flats" who visit the race course or other places where gambling is looked upon as a more or less legitimate pastime. The ingenious mechanical devices which have been employed for this purpose are really astonishing. Such clumsy appliances as loaded dice are, of course, out of date, though one ingenious "sharp" invented a table, the top of which was sheet steel under a very thin cloth covering. By means of an electro-magnet concealed within the table, its top could be converted into a powerful magnet, and the dice (which were prepared by having one side of metal while the rest were ivory) could be attracted to the table when the current was on or would fall in any haphazard position when the current was shut off. Dice, however, are generally suspected, and hardly anyone would venture to stake money upon the fall of the dice any more than he would upon "three-card monte."

Cards are the most fertile field for the gambler's revenue. Winning at cards depends largely upon the possession of certain high cards or the aces which win the tricks, and to gain possession of these cards is the gambler's object. For assuring this, various devices have been employed called "holdouts," mechanical contrivances concealed in the sleeve, which by a very slight pressure or movement in one direction, will instantly shoot out the required card into the gambler's hand and recede again into the sleeve. One of the most ingenious and perfect of these was invented by a gambler named Keplinger, and the device has ever since been known as the "Keplinger holdout." The apparatus was worked by the knees, so that no motion of the arms or body was necessary. A slight separation of the knees was all that was required to shoot the card into the gambler's hand. The knees were thereupon relaxed, and the "holdout" receded like a flash into the gambler's sleeve.

Another variety of "holdout" is that concealed in the waistcoat, and here the hand is held close to the body with the cards outspread while the thread is pulled, and in that manner a card shot into the hand under cover of the remaining cards. This, however, is a dangerous procedure which is rarely employed. A small but ingenious species of "holdout" is that known as "the bag." The small, sharp point, seen in the illustration, is stuck into the wood of the under side of the table, in such a manner that the flat bar runs along parallel to and just touching the wood of the table beneath. One or more cards are now inserted into the clip thus formed, and may be withdrawn by the fingers in the act of drawing cards on the table toward the body.

A daring yet simple variety of "holdout" is attached to the sleeve. It is buckled around the shirt sleeve under the coat, and two small pointed hooks, facing outward, press against the coat sleeve. These hooks may be separated or brought nearer together by pressing upon a small rubber tube. If now a card be placed against the coat sleeve, on the outside, and the clips separated and then released, they will clasp the edges of the card through the cloth of the coat, and it will be retained there by the pressure of the spring in the "holdout." So long as the arm be held *downward*, the card is invisible; but the card may be obtained possession of by the fingers of the other hand when resting against the sleeve of the arm to which the "holdout" is attached.

A still simpler device is to have a small pocket cut in the coat sleeve at the seam. The "pocket" is merely a slit about three inches long, into which the required card is inserted. The fingers grasp the card and withdraw it with the others at the required moment. Another variety of "holdout" is known as the "ring holdout." A ring is worn on one of the fingers, to the inside of which is attached, as part of the ring, a small wire clip or spring, flesh colored. The card is inserted under this spring, and in that manner is retained within the palm of the hand by the pressure. Experts in sleight-of-hand would not require a clip of this character, being enabled to palm the card without any mechanical aid.

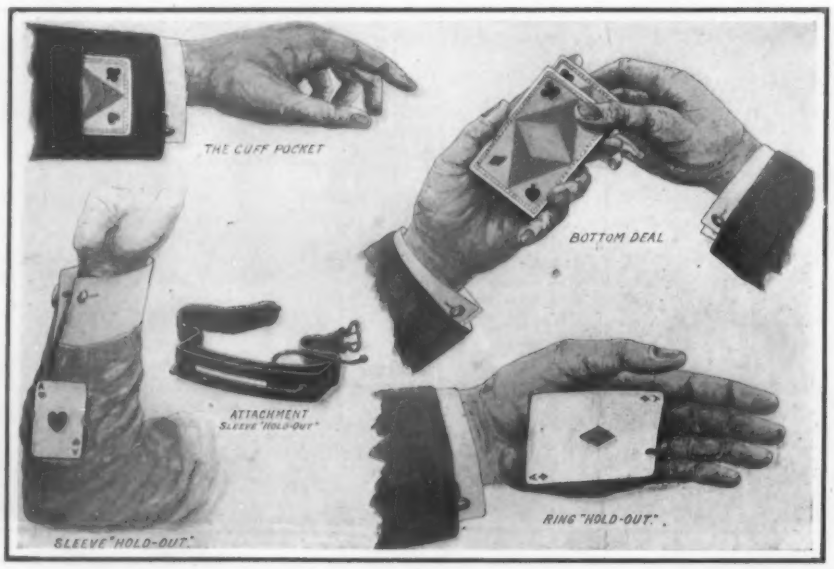
Besides such devices as those just mentioned, the gambler depends for his success partly upon his dexterity in handling the cards during the actual progress of the game. Of course, marked cards are frequently employed for this purpose, but the expert gambler will succeed in marking the cards with his thumb nail during the course of the play, so that, at the end of a few hands, he knows practically every card in the pack from the slight indications upon its back. Sometimes, also, cards are bent more or less slightly to insure their recognition—either individual cards or a number of cards together. If half a pack is bent in this manner, this is called " the bridge." Each card in this section then has a slight curve, as shown in the illustration.

THE ELABORATE OUTFIT OF THE GAMBLER.

A gambler may even deal to himself or to any person forming the circle a particular card which is known to him. This card is at the bottom of the pack, and the "sharp" deals off the cards from the top of the pack continuously until he reaches the person into whose hand he desires to place the card next to him, when, by a rapid movement, he withdraws, not the top but the bottom card with his fingers instead of his thumb. This trick, when rapidly and well executed, is practically undetectable.

Card "sharps" also employ other devices for gaining knowledge of the cards dealt to every member in the circle. In order to gain this knowledge, a small mirror is employed. Sometimes this mirror is attached to a needle point, and fixed to the under side of the table nearest the dealer. If, now, in dealing, each card be passed over the mirror in turn, the gambler will be enabled to tell the position of each card dealt, and to follow the cards before a single play can be made. A mirror of this character is a dangerous device, and it is easily detected. For this reason, very ingenious schemes have been employed. A small mirror is inserted into the bowl of a pipe, laid carelessly on the table, the bowl being turned slightly upward and toward the dealer. Now, in dealing the cards, they are passed each in turn over the bowl of the pipe, and in this manner the magnifying glass it contains conveys to the "sharp" all the required knowledge as to the cards contained in each sitter's hand. Occasionally "sharps" employ a mirror ring for this purpose; a large signet ring being used which, during the course of play, is swung around so that the signet faces the palm instead of the back of the hand. The signet then swings open on a pivot hinge and discloses a tiny magnifying mirror beneath. By the aid of this mirror, the majority of cards can be detected as dealt. At least aces and court cards can be distinguished from cards of lower values, which is the chief thing to be discovered.

There are a number of other ingenious devices employed by professional sharps, but the above will at least give the reader an idea of the extent to which this practice has been carried, of the remarkable ingenuity displayed by manufacturers of such devices, and of the dexterity and daring of the gamblers themselves in employing them.



SOME GAMBLERS' TRICKS WITH CARDS.

Macrographic Examination of Metals.

The macrographic examination of metals consists in examining with the naked eye the surface of the metal, which has been polished and chemically treated in such a manner as to bring out its constitution and its impurities. In micrographic or microscopic examination the particular objects of study are the character and chemical properties of the alloy, while macrography concerns itself with the physical properties. The principle of the methods used is as old as the first methods of damascening, in which an acid mixture was employed which blackened in different degrees the strips of iron and steel which had been welded together in the formation of sword blades.

The operations of macrography are essentially two: first, the preparation of the polished surface, which must be absolutely free from grease; secondly, the chemical treatment, which is preferably effected with dilute sulphuric acid, in which the entire piece of metal is immersed for several hours, or with an aqueous solution of iodine and potassium iodide. The indications furnished by the examination of the surfaces thus treated are useful in determining the quality of steel and detecting the presence of slag and of blowholes. When a bar of metal is cast there is frequently produced near the surface a blowhole which is filled with the more fusible impurities. Usually this pocket extends through one-third of the thickness of the bar. Macrographic methods show whether the blowholes have been obliterated either by pressure or by removal of the upper part of the bar, and they are also capable of detecting in forged pieces traces of these blemishes which have been left after the tooling.

The statistics of the American Railway Association show that the net surplus of freight cars on the railways of the country on February 16th was 14,309, as against 24,975 on February 2nd; 26,844 on January 19th; and 38,416 on January 5th. The increased demand for box cars and coal cars has been sufficient to call into service all idle rolling stock of that kind.

BIG FIR TREES OF THE NORTHWEST.

The fir trees of the Pacific Northwest occasionally attain such proportions, especially in the territory near Puget Sound, that the stumps after the trees have been cut down are employed for novel purposes. In some portions of Washington one can see these huge stumps, which have been hollowed out and actually made into temporary homes for settlers. To make a stump house, it is only necessary to remove the material from the interior, leaving enough to form walls of suitable thickness. Then a roof of boards or shingles is put over the top of the stump, holes are cut for windows and doors, and the dwelling is practically ready for occupation. A number of these stumps have been used by settlers on what are called logged-off lands, until they have been enabled to construct larger and more convenient dwellings. After the stump home has been vacated, it is turned into a stable for the horses, or sometimes into an inclosure for chickens or hogs.

Next to the big tree of California, or sequoia as it is termed by the scientists, the fir as found in Washington and Oregon has the largest diameter of any tree in America, and probably in the world. Some have been cut down which actually measured 15 feet in diameter at the point where the incision was made. As they decay very rapidly after the timber has been removed, usually the interior can be hollowed out with little difficulty. Sometimes they are used for dancing platforms, as is shown in the accompanying illustration, some being large enough to accommodate four couples. Another custom is to turn the big stumps into playgrounds for the children, who reach the top by pieces of wood nailed against the sides or by ladders, and a pretty sight which a traveler often sees in the northwest is one of the big stumps turned into a flower bed and covered with the trailing vines.

A FIR STUMP IN WASHINGTON, BIG ENOUGH FOR A DANCING PLATFORM.

STUMP OF A FIR TREE IN WASHINGTON WHICH SHELTERS A FAMILY OF FIVE.

How to Repair and Clean Typewriters.

BY LOUIS A. FLEMMING.

As every user of a typewriter knows, the platen or roll is the part of the machine that wears out first. The constant hammering of the type against the surface of the platen soon makes indentations in it, which in a short time amount to such a degree of roughness that it is impossible to produce good, clean work.

A compound has recently been discovered that will restore the platen to its original smooth condition no matter how badly it is worn or how long it has been in use.

The formula and method of using the compound are as follows: The ideal material for use in repairing platens would be hard rubber, but in the process of vulcanizing, the rubber becomes insoluble to a great degree in the solvents generally used for making rubber solutions. As a substitute for hard rubber, celluloid is recommended. The hard variety should be used, which is sold under the name of imitation ivory. This is soluble in acetone, amyl acetate, and various other solvents. One of the best solvents is a mixture of eight ounces of acetone and one ounce of amyl acetate.

In the absence of anything else in the way of celluloid, any ordinary article made of this substance, as a comb, may be used. There is a variety of celluloid used in the manufacture of combs which is quite satisfactory for this purpose. The color also is good where this variety can be obtained.

In using celluloid on platens it is advisable to use something with it that will give it hardness, such as finely powdered silica, infusorial earth, emery, or other similar substances. About one ounce of powdered emery to each eight ounces of compound is a fair proportion. Powdered soapstone also works well for the purpose.

The celluloid solution should be made as thick as a very heavy syrup or molasses. In fact, as thick as may be spread with a brush. The heavier it is when used, the sooner it will dry. If a light colored celluloid is used, it is advisable to add some coloring matter, which may be lampblack or preferably gas or carbon black. Just enough should be used to give the desired grayish color. Remove the platen from the machine. The work may be done with the platen in the machine, but great care must be taken to protect the working parts from the dust formed when smoothing up. It also takes less time to do the work when the platen is removed.

Wash the platen with gasoline to remove all grease and dirt, and rub it with a piece of fine emery paper, to give it a new, clean surface. With a brush, paint the mixture carefully over the platen, giving it a good thick coat.

Lay the platen aside for six hours or longer for the composition to harden. Then with a piece of fine emery cloth smooth it down, taking care not to cut quite to the original surface of the platen. This is the delicate part of the work; and upon the care used in doing it depends the quality of the job.

Acetone and amyl acetate can be obtained at any drug store. It usually requires from two to five hours for the celluloid to dissolve. Breaking it up into small pieces hastens solution. The solution should be prepared in a wide-mouthed bottle that can be securely corked. It should be shaken often during the process as this will prevent the celluloid from forming in lumps. The bottle should be kept tightly corked and away from fire, for it is highly inflammable. Should the mixture become too thick, thin it with a little more of the solvent; if it is not thick enough, add more celluloid.

A cheap and simple cleaning compound for typewriters is composed of the following ingredients:

Paraffin oil	1 pint
Benzol	5 ounces
Cresol	1 drachm
Kerosene	4 ounces

Mix thoroughly.

This compound was for years a secret confined to one or two of the large companies that rebuild typewriters. The machine is immersed in the compound which quickly and thoroughly dissolves and removes all dirt, gum, grease, etc. It does not injure the enamel, but on the contrary improves its appearance, making it as bright as when new. In making up any desired quantity of this compound retain the proportions given in the formula, except that should a quicker drying mixture be desired the quantity of paraffin oil may be reduced and the kerosene increased. In all cases the lightest grade of paraffin oil should be used and not the heavier lubricating oils. If white paraffin oil is used, a water white fluid is produced; if dark paraffin oil is employed, the liquid has a light amber color. Oil of citronelli or oil of sassafras may be substituted for the cresol, which has no action whatever and is used simply to disguise the composition of the compound. To use the compound, fill a tub of sufficient size with it. Place the machine in it and allow it to remain in the fluid for half an hour. By lifting it up and down gum and grease will be washed off. Then remove it and dry it with a soft cloth, brushing the parts not accessible with the cloth. About two gallons of the mixture are required in the average case. The compound may be used as long as any of it is left as the dirt settles to the bottom of the tub and the clean portion may be drawn off. It is necessary to keep it covered tightly when it is not in use to prevent evaporation of the benzol. A fair preparation may be made by using one-third the quantity of paraffin oil mentioned in the formula, an equal quantity of kerosene and from one and one-half to two times as much gasoline.

The Transformation of Sea Water Into Fresh Water.

The belief was prevalent among the savants of the 17th and 18th centuries that a hermetically sealed earthen vessel dipped into the sea would fill itself with fresh water. At the present day it is difficult to say on what this belief was grounded. It surely could not have been evoked by experiment. In a similar sense Marsigli, the founder of oceanology, made in the year 1725 an experiment which effected the filtration of sea-water through a system of fifteen pots filled with washed garden-earth or sand and so placed as to let the water fall as if in a cascade. It is stated that the palate disclosed a definite diminution of the presence of salt. Similar assertions are everywhere current among seamen.

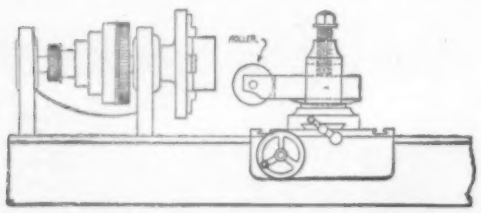
A scientific test of the endeavor to free salt from water was recently made by the French investigator Thoulet. His report which appears in the minutes of the Académie des Sciences of Paris states that the presence of salt can be reduced by filtration. Forty centimeters of the length of a glass tube, which was one meter long and was placed in a perpendicular position, was filled with sea-sand, and the rest of the tube was filled with sea-water; portions of the filtrate were examined at intervals of the experiment to ascertain its density and chemical composition. The result was that in the initial stage of the experiment density as well as saline content were found to be moderately reduced; very soon thereafter both recovered their original value. The early decrease of value is explained by the mechanical attraction which every chemically neutral body exercises on the molecules of a substance in solution as soon as the body comes in contact with the solution. In nature, too, sand fails to effect the separation of salt. Through shipwrecked seamen it became known that relatively fresh water may be found on very low and barren coral reefs in the Pacific Ocean by digging to a trifling depth in the coral sand. It is not, however, as was supposed, seawater freed from salt through the layers of sand, but is simply rain water that is retained by a sandy stratum and by it protected from admixture with the sea water. Similar phenomena may be observed on the European coasts. They may be considered the key to the popular belief, now contradicted, that sea water can be sweetened by filtration through sand.

According to the Electric Railway Journal, a novel type of electric locomotive has recently been built for canal haulage near Bremen. The locomotive runs on a quay which has to be kept clear for the passage of drays and for other purposes. To secure the necessary weight for adhesion, it was decided to build the locomotive in the form of two U's with a connecting girder. The current is taken from overhead wires.

A TOOL FOR CENTERING WORK IN A LATHE.

BY H. D. CHAPMAN.

The accompanying drawing shows a handy tool for centering work in a lathe chuck. When a job is to be faced off it requires a little time to get it to run

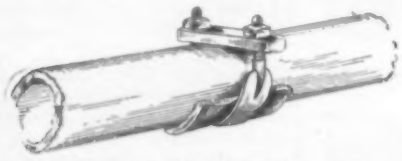


SIMPLE METHOD OF CENTERING WORK IN A LATHE.

true. The drawing shows how the work can be expedited by the use of a simple tool. The tool is made of tool steel; the roller is hardened. When a job is placed in the chuck to be faced off and the face of the work does not run parallel with the face of chuck the roller tool is secured in the tool post, and the lathe carriage is then run up by hand until the roller strikes the face of the job. As the work wobbles in the chuck the high position will be struck by the roller and forced true with the face of the lathe. After the work has been trued it is then ready for machining.

REPAIRING A LEAK IN A STEAM OR WATER PIPE.

A pinhole will occasionally cause a leak in a steam or water pipe, after the piping has been put up and perhaps been in use for a considerable time. It can be repaired with an ordinary carriage clip and yoke



MENDING A STEAM OR WATER PIPE.

and bit of sheet rubber packing, although a piece of an old rubber shoe would last for years.

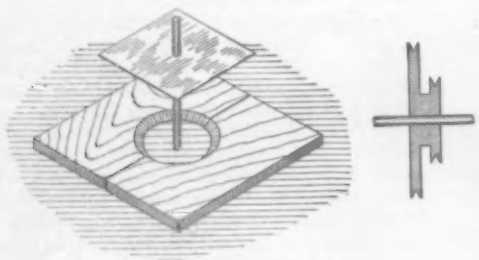
You can readily see the application by referring to the sketch. The writer stopped two leaks in steam pipes fifteen years ago by this method. The pipes have been in service ever since, and have not leaked. They were both in rather inaccessible places, where it would have been difficult to renew the pipe. At the same time, being in out-of-the-way places, the appearance of the patch did not matter.

GROOVED PULLEYS FOR EXPERIMENTAL WORK.

BY CHAUNCEY W. NIEMAN.

Small grooved pulleys or sheaves can of course be turned on the lathe, but a substitute for the lathe, which in some respects is quicker and cheaper, will be found very advantageous. The description of such a method follows:

In a piece of wood of the thickness desired for the pulley bore a hole of a diameter equal to that of the pulley at the bottom of the V-groove. With a half-round rasp or large drill countersink this hole on both sides. Split—do not saw—the board in two down the



MOLD FOR CASTING PULLEYS.

middle of the hole, then nail or clamp it tightly to a smooth board, the two halves being pressed firmly together. Find the center of the hole with a compass and drive in a headless nail, taking care to get it vertical, to serve as a "core" for the bearing. Have handy a piece of cardboard considerably larger than the pulley, with a hole in its center the size of the nail. Pour melted solder into the mold, and quickly slip the cardboard over the nail and down upon the mold. This will force out superfluous metal and make the upper side of the pulley smooth. When cool, unclamp the mold and pull apart where split. A knife or rasp will then do all the finishing necessary. Two or more pulleys can be cast together by placing the molds one upon the other, with their centers common. The figure shows such a combination. A hub may be made in a similar way. If a stronger bearing is wanted, as for an idler, wrap a strip of brass around the nail and let it become soldered to the metal.

Along similar lines a cogwheel may be cast, but great care is necessary in cutting the teeth in the wooden mold. A large number of pulleys can be cast from one mold, and for duplication work this method will be found quicker than the lathe.

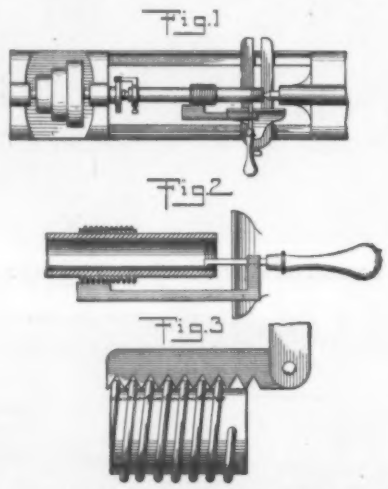
HOW TO CUT THREADS WITHOUT A SCREW-CUTTING LATHE OR THREAD-CHASING TOOL.

BY JOHN BERGSTROM.

The ordinary way to cut a thread by hand is to use a thread-chasing tool, with the number of teeth per inch wanted. The difficulty in chasing a thread is in the starting. It takes a great deal of practice, and even then a "drunken" thread may be the result.

The accompanying illustrations show how this can be done in a very simple way and yet give an absolutely true thread.

If a number of screws are to be cut the best way to proceed is as follows: Take a thin piece of tubing that will just fit over the bar or bolt to be threaded. In one end drill a small hole, into which fasten the end of a spring brass wire, preferably by soldering. Then wind the wire around the tube half a dozen or more turns. Now take a thread gage. Select the number of threads per inch wanted and place it lengthwise of the tube, bringing one turn of wire in each



SCREW-CUTTING ATTACHMENT FOR LATHES.

notch, after which pull the free end of the wire and keep it tight. Solder the coils to the tube, using only the corner of the soldering iron; then move the gage one-third of a turn around the tube and repeat the soldering, and finally move the gage again an equal distance and solder.

It will now be seen that there is a perfect thread or spiral around the tube, which we will call the master thread. This master thread must be slipped on the bar or bolt to be threaded, so that it will not turn, allowing enough room at the end for the threads to be cut. The cutting tool consists of an ordinary hand tool, with only one point. Procure a small piece of wood, long enough to reach over the master thread and to the end of the bolt. Into this piece of wood drill a hole just large enough for the cutting tool to slip through and fit snugly.

In operation the cutting tool is held in the right hand, in the usual way. Then with the left thumb press the piece of wood against the master screw and start up the lathe. The master screw will feed the cutting tool the right pitch. As soon as a good start is obtained the tool will feed itself without the aid of the master screw.

When the thread is finished the master screw may be removed and slipped over another bolt to be threaded. The spiral may be wound right or left, according to the direction wanted. Any number of threads may thus be formed. That is to say if a triple or quadruple thread is wanted, it is only necessary to wind three or four wires around the master thread and proceed as before described. This arrangement is also very handy in starting a thread when the ordinary chaser is used, as it will always insure a straight thread. It is not necessary to nick or mark the wooden block, as it readily takes the impression of the thread from the master screw.

Fig. 1 illustrates a plan view of an ordinary lathe, ready to cut a thread. Fig. 2 shows how internal threads may be cut and Fig. 3 shows the master thread.

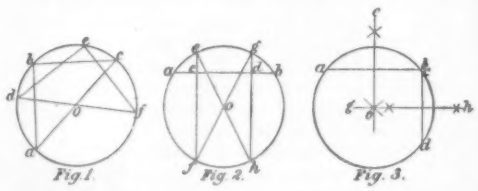
SIMPLE METHODS OF FINDING THE CENTER OF A CIRCLE.

BY AUGUST MENCKEN.

Very often it is necessary in the drawing room or shop to find the center of a circle, a disk or a piece of shafting, etc., when the diameter is not given. Below are three ways in which this can be done:

The first, Fig. 1, is the method usually used. It consists of two right triangles drawn so that their angles are in the circumference of the circle as *a b c* and *d e f*. The point where their hypotenuses intersect is the center of the circle.

The second method is shown in Fig. 2. Draw any chord as *a b* and take two points on it as *c d* equidistant from its ends. At these two points erect perpendiculars to *a b*, cutting the circle at *e f g* and *h*. Then



THREE WAYS OF FINDING THE CENTER OF A CIRCLE

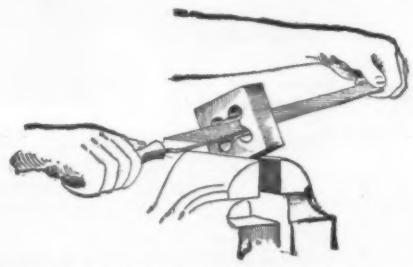
draw *e h* and *f g*, and the point where they intersect will be the center of the circle.

Fig. 3 is similar to Fig. 2. Draw any two chords as *a b* and *c d* and at their centers erect perpendiculars to them. The point where the perpendiculars meet will be the center of the circle.

HOW TO SHARPEN A PIPE DIE.

BY ALFRED F. BISHOP.

I discovered a short time ago that a mill-cut file would sharpen a solid pipe die quite easily and quickly without removing the temper in the die. The first few rubs of the file will slide without cutting, this being due to the grease on the die. Just as soon as the greasy surface is thoroughly worked off,



A PIPE DIE CAN BE SHARPENED WITH A FILE.

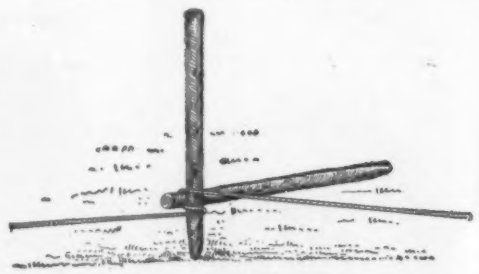
the file will commence to cut, and will cut very smoothly, making a keen edge on the cutting thread. Heretofore I have always worked on emery grinders to try to do this work without removing the temper of the die, but found they worked very slowly on account of the small diameter of the wheels, also that it was quite a nuisance to set the die for the cutting wheel. Most mechanics would not try the file, not having the least idea that it would do the work. That was my case.

A "SPANISH WINDLASS."

BY GEORGE H. M'ENTIRE.

Herewith is a sketch of what is known among cowboys as a "Spanish windlass."

One end of the rope is made fast to the load, the other to a "dead man," tree, or fence post. The vertical post or timber which is used as a drum is rotated by means of a bar placed in a nearly horizontal posi-



A "SPANISH WINDLASS."

tion bearing against the vertical post but not fastened to it. The rope is passed around the end of this horizontal bar.

One man holds the post against the ground and vertical, and a second man walks around with the bar passing it above the rope, and thus winding the rope on the vertical post.

The whole windlass moves toward the "dead man" as the rope is wound on, so no permanent hole can be

made in the ground for the vertical post to turn in. This windlass is very useful for pulling wagons and autos out of the mud. All one needs is a rope and two posts or timbers.

THE WEIGHTING OF TOOL HANDLES.

BY A. J. JARMAN.

How often it occurs that when a tool such as a brad awl or particularly a keen-edged chisel is thrown down in a hurry it will roll off the bench and fall upon the floor, perhaps into a glue pot or upon the foot of the workman, or on a hard surface that will nick or dull the cutting edge. The following little scheme is employed with all the wood-working tools of the writer and found to answer admirably: Bore a hole in that part of the handle that rests upon the bench, with a five-eighths rather dull cutting twist bit. Bore the hole only as far as the center of the handle, but no farther, or the object desired will be defeated. A dull cutting bit makes a rough-sided hole. Into this pour some melted lead (of course the lead should not be too hot). When the lead becomes set, trim it off evenly with a fine rasp and finish off with coarse sand paper. Now when the tool is thrown down hurriedly upon the work bench it will not roll over more than once and will come to rest leaded side down. This little dodge is not only inexpensive, it is thoroughly effective; it will not only save annoyance, it will prevent many an accident, which no one can realize more than the man who is handy in the use of wood-working tools.

BRAD AWLS WITH HANDLES WEIGHTED TO PREVENT ROLLING.

The illustration shows two brad awls, fitted as described, and used by the writer for several years.

AN ILLUMINATED GAS HEATER.

BY F. G. WILLIAMS.

The accompanying illustrations show how an illuminated gas heater can be made. The heater is mounted on a suitable pedestal, such as a wrought-iron stand or a base of some old discarded oil lamp. The heater proper consists of a burner *A*, a screen *B*, and an outside cover or shield *C*, which is removable. A suitable handle is provided at the top of the cover for this purpose.

Through the base passes an ordinary gas pipe, and at its lower end a stop-cock is fitted with a suitable attachment for a rubber hose, so that it can be connected to the gas supply in the usual manner. At the upper end of the gas pipe is attached an adjustable sleeve for regulating the proper proportion of air to be mixed with the gas. The sleeve terminates in the burner proper, which is made with double walls. The lower part is made conical, so as to better distribute the mixture of gas and air. The burner proper is made from ordinary culinary utensils; the inside part from a small pan, and the outside part is made from a colander with very small holes, the smaller the better. These two parts are riveted together at the top, so as to make them tight. The lower or conical part may be made from ordinary black iron and may be fastened to the upper part as well as to the lower or gas pipe in any suitable manner, as by riveting or seaming.

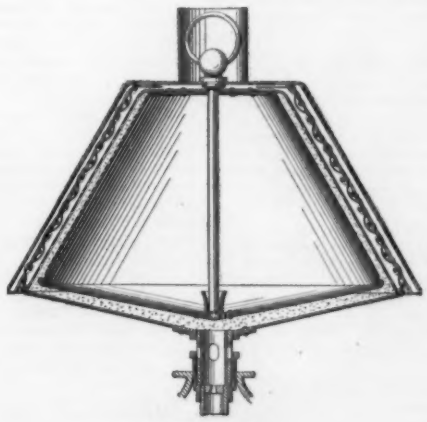
The screen is made of wire netting fastened together, forming a cone with the same taper as the burner. The upper strands are bent inward so as to serve as a support for the cone. On this screen long asbestos fibers are attached. The raw Canadian rock asbestos is procured and the fibers pulled out in long threads, sometimes two or three inches long. These fibers are fastened and spread all over the surface on top of the perforations in the burner, and when the gas is lighted an incandescent mass will be formed which radiates heat but is not consumed. The outside cover is also made from some sort of pot or pan, provided at the top with a suitable handle, terminating with a downwardly extending rod, which passes through holes in the top of the burner proper and fits into a small socket at the lower or conical end. This is for the purpose of keeping it securely attached to the same. A number of holes at the top should be made for the circulation of the air and spent gases.

The cover may be cut out or perforated in such a way as to represent a landscape or any conventional design. The inside of the shield may be lined with mica so as to render the heater more safe. The mica may be tinted in almost any color desirable. Aniline colors are dissolved in amyl acetate, then mixed with amyl acetate collodion (commonly called banana oil). This mixture is applied with a soft brush and will dry very smooth. It will withstand a great deal of

A GAS HEATER IN THE FORM OF A LAMP.

heat. When the burner is lighted the gas will burn and form small blue beads on the outside of the perforated burner, and as the flame strikes the asbestos fibers it will make them glow very brilliantly and change colors as the fibers are moved to and fro by the currents of air passing between the cover and the burner.

If artistically made the heater may be used on the top of a table and will be a real ornament to the house but, of course, will show off to a better advantage in a dark room. The outside cover is not at all necessary, but is only used to get the desired effect.



SECTIONAL VIEWS SHOWING DETAIL OF CONSTRUCTION.

FILES AND THEIR USES.

BY HOMER CLOUKEY.

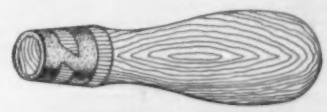
Nearly everyone who has had much filing to do, knows what a difficult thing it is to get hold of a reliable handle. Wood ones will split even if ferruled, or the brass ferrule will become battered and weakened. Steel ones are rarely satisfactory, and the set screws are always in the way. The following is a simple method of reinforcing the file handle: At the end of the file handle turn two 3/8-inch grooves, placing them 3/8 inch apart. Connect by two diagonal grooves of the same size, wrap with a piece of paper, and pour Babbitt metal or solder in the top. Trim up, and you have an everlasting file handle.

A simple and inexpensive file cleaner is made by hammering either end of a medium or large sized common wire nail until it is flat. This tapering flat piece is then trimmed off square, with a file, and filed to an even thin edge. This cleaner is self-adjusting to all files and is far more effective than the expensive wire brushes usually used.

Files as nearly everyone knows are made from the best of tool steel to hold a sharp and strong edge under tremendous strain. This steel primarily has to be capable of being easily worked and, after it is worked, of holding the finest temper imaginable. It will be seen therefore that it must necessarily be the best of raw material for the articles enumerated below. It must be remembered that files have a very high temper, and therefore in all operations in which this degree of hardness is not essential, the temper should be drawn by heating and cooling down slowly in order to render the steel less brittle. In fact, the temper and quality of a good file are instanced by the fact that the writer has seen made and has tried satisfactorily a razor ground from a 10-inch flat mill file on a regular emery wheel and then honed and stropped into shape.

Perhaps the first use I ever saw old files put to was a full set of nail sets made from 6-inch triangular files by snapping them off to an even length at five inches, and grinding the points down to various sizes required. The top ends were rounded off nicely, and the teeth were ground just enough to give a beautiful knurled effect to the set. I asked the mechanic who made these tools why he hadn't used rat-tail files and make them round, but he said he just wanted them different from the common run of tools. Some years later I did have the pleasure of seeing a beautiful set made from round files. Only with these there was left an unground strip between the two ends, to afford a good grip for the fingers.

Another splendid set which was evolved out of files



REINFORCED FILE HANDLE.

by a machinist who had occasion to do a little special pattern making from time to time, was a complete set of little V-shaped gouges and flat chisels and half rounds, all made with curved shanks to reach otherwise inaccessible places. These were made by forging small files of the requisite cross section into the curve required, and grinding the shank and edge to the tool desired. By requisite cross section I mean that he always took a flat file to make a flat chisel, and a triangular one for a V-shaped one, etc. When these were ground nearly to their finished sizes, he hardened them by suddenly cooling in oil from a cherry-red heat, and then tempered them to a medium straw and again cooled them, after which they were given their final grinding and sharpening. The tang on the file was just the thing to fasten the finished tool in a firmly ferruled handle, and his tool was complete.

If you want a good heavy center punch, snap off either a rat-tail or triangular file of the right size to a convenient length, say five inches; grind a good long taper on it up to the last 3/4 of an inch, and make the taper shorter to give more metal to the point, and there you are.

Sometimes a file will help out a serious difficulty if it is only used. An occasion arose in which it was absolutely necessary to shear off some large spikes in some built-up timbers that had already been placed in a building. It looked well nigh impossible until I thought to sharpen a file to an edge on the blunt end similar to a cold chisel, and by driving this in between the plies it was a simple matter to cut the spikes, though to tell the truth it spoiled the edge of the file several times before they were all cut.

Perhaps the most common use to which they are put is to make them into burnishers for sharpening cabinet scrapers and kindred tools. For these they are simply mounted in a handle, and ground until they are perfectly smooth. Triangular files are the ones commonly used for this purpose.

A round file makes an efficient awl for any purpose, and with scarcely any trouble to transform it ready for its new duties, as it needs only to be sharpened.

An amateur desiring to take up brass craft work, and not wanting to pay the exorbitant price generally exacted for an outfit, decided to make one from files. In less than two hours he had made every tool illustrated in a large assortment, and they were a creditable-looking outfit, comprehensive enough for any ordinary purpose, and included all the customary piercing, denting, tracing, and stippling tools.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

HAT-PIN ATTACHMENT.—C. J. Edlavitch, Baltimore, Md. This improvement provides a guard to be fastened over the point of a hat pin for preventing the latter from injuring persons in the vicinity of the wearer. The device can be applied directly to the point of the ordinary hat pin or removed instantly without screwing the guard to the pin or fastening it in any other way than by a slight pressure.

Electrical Devices.

COMBINED SPARK-COIL AND INDICATOR.—J. V. Thorndike, Randolph, Neb. In this case the invention relates to electric spark devices, Mr. Thorndike's more particular purpose being to combine a spark coil with an appropriate indicator for disclosing the condition of the coil, in order that the operator may readily ascertain if the spark is being made properly.

Of Interest to Farmers.

FRUIT-GATHERING VESSEL.—J. H. Ogburn, Wenatchee, Wash. The device is for use in gathering fruit, vegetables, and the like. The inventor employs a body portion which is in the form of a metal or other pail which enlarges or tapers towards its lower discharge end so that the fruit may be freely discharged without bruising, binding, or choking in the discharge, and the pail is preferably made of an elongated oval form.

ELECTRIC VACUUM MILKING-MACHINE.—G. B. Champ, Duquesne, Pa. This device is to a certain extent automatic in its operation and does not therefore require so much the service of an attendant. The invention provides a special form of electro-magnetic automatic vacuum-shut-off valve for stopping the action of the vacuum on the cessation of the flow of milk, thereby avoiding all danger of injury to the cow which may be sensitive to a continued operation.

Of General Interest.

FUME-ARRESTER.—C. C. Whitmore, Butte, Mont. More especially this invention is applicable to those furnaces in use in smelters, in which certain ores are roasted which give off gases and fumes that are injurious to vegetation and which tend to render the atmosphere of the surrounding locality unfit to breathe. The device may be attached to the furnace of the ordinary smelter and by which the smoke and gases may be condensed and the injurious substances extracted.

COMPOSITE FABRIC.—E. Strauss and W. B. Erskine, New York, N. Y. This invention pertains to a fabric of the elastic type. An object is to provide a fabric which is strong, durable, and inexpensive to manufacture, and a fabric of high elasticity, which will stretch readily without tearing the non-elastic components thereof.

DOOR-STAY.—M. Logan, Plymouth, Ind. The invention relates more particularly to stays such as are adapted to be used on gates, screen doors, or the like whereby the doors are braced, to insure their being evenly supported in normal condition. The aim is to provide a device which will prevent a door from sagging, and which will always permit it to swing freely while being opened or closed.

SMOKING-PIPE.—C. E. Klein, Franklinville, Pa. The principal objects in view are: to provide a pipe which may be readily cleaned; one in which the nicotine bearing liquid of condensation is trapped in a member from which it is readily and quickly drawn; and to provide a construction whereby the ash and coked particles of the pipe structure may be readily removed.

COMPOSITION.—W. R. Humphreys, Springfield, Mo. The invention refers to waterproof polishing compounds, and it consists in ingredients which are compounded in specified proportions. An object is to provide a metal polish which has the form of a paste, and impervious to water. A further object is to provide a compound which cleanses as well as polishes.

COMB.—J. W. Gonce, Chattanooga, Tenn. This comb is fashioned preferably from metal, and formed from teeth assembled upon a rod, the teeth being suitably spaced and forced to attach to the rod under pressure, thus obviating the manufacture of the comb from the single piece of material, while resulting in the production of an article substantially equal to one formed from a single piece.

SPIROMETER.—L. D. Childs, Chester, S. C. This invention comprises a cylindrically formed apparatus and is intended for use in the exercise of increasing the lung capacity of the party using the spirometer. There is very little space left between the movable part and the fixed part of the device, and when the movable part is in a certain position but little air remains to become putrid. A suitable mouthpiece is connected with the free end of the hose.

DISTILLING DEVICE.—O. A. Nenninger, El Paso, Texas. This apparatus comprises means for boiling water and adapted to connect either with a still or with the hot water boiler of a kitchen range when there is no fire in the range. A connecting system of valves and other appurtenances enable the desired connections to be readily made by throwing a handle member which controls the valves.

SHOW-CASE.—A. Reinle, Baltimore, Md. This invention is an improvement in show-cases such for instance as the ordinary inside show-cases, and cases in the form of show windows and the like. The inventor provides a channel strip which fits over the edge of one glass plate and is connected with the under surface of another. Cement is used within the strip and secures the latter in connection with the glass plate. In repairing or replacing glass a facing is used which can be severed by means which avoids cutting the cement, which is difficult when the compound has hardened.

RAISING DEVICE FOR MOLDS.—J. S. Linton, Anderson, Ind. The aim in this invention is to provide a device for building a reinforced wall of concrete or the like, the mold thereof being adapted to be raised from and over the concrete wall after the same has sufficiently set, and constituting the form for a second section of the same wall, and so on upwardly until the wall is completed.

NECK-YOKE.—J. Hullt, Silverton, Colo. The improvement is in neck-yokes, and particularly in centers and has for an object to provide a novel construction of neck-yoke center which will possess the maximum strength as well as be flexible in all directions. The neck-yoke center is made of harness and sole leather.

WATCH-PROTECTOR. — B. Greenberg, Philadelphia, Pa. An object of this inventor is to provide a watch protector for convenient and secure attachment to the pocket of a vest or other garment, and arranged to permit the wearer of the garment to conveniently place the watch in position in the protector or remove it therefrom and to prevent abstraction of the watch by pickpockets or unauthorized persons.

FOLDING BOX.—F. G. Fischer, New Haven, Conn. The improvement provides a box having an inner compartment excluding dampness from the box; provides a box, the outer wall of which is so constructed as to form no visible joint; provides a construction wherein both the inner and outer walls of the box are provided with openings which aline, and provide a construction having a hinged cover having the four structural sides firmly secured to form a rigid structure.

PIANO-VIOLIN.—L. Breitenmoser, Napoleonville, La. The invention is an improvement in violin-pianos, and the purpose is the provision of an instrument consisting of strings arranged and tuned like the strings of a piano and vibrated by a rubber instead of a hammer, and when the resulting tone will approach that of a violin.

MOLD FOR CEMENT BLOCKS AND WALLS.—C. A. Torrance, Gibbon, Neb. Mr. Torrance's invention is an improved collapsible core, for use in molding hollow cement blocks and building blocks. In building a hollow cement wall or in forming a hollow cement building block, the body of the mold employed being placed in position, the collapsible core is then adjusted in place in the center of the same its sides opened or distended, and by the aid of other means provided a hollow wall may be built up to any required height.

Hardware and Tools.

SAFETY-RAZOR.—L. Nahemow, New York, N. Y. By this invention the cutting edges of the blade are retained close to the guard plate at all times during the use of the razor, and each guard or guard plate is made as a separate section, with means to spread the sections apart or move them together according to whether a close shave or otherwise is desired.

CLOSURE-REMOVER. — F. Martin, Sr., Sherrill, N. Y. The invention has for its object to provide for a device for removing the covers of fruit jars and the like, without fear of damaging the jar or injuring the hands. It can be quickly affixed to a jar and by slightly pressing downwardly on the handle of the implement, the cover is loosened and raised from the jar.

COMBINATION-LOCK.—S. N. Friedman, New York, N. Y. This is a keyless lock having a simple combination which must be known before the lock can be opened. An object here is to provide a lock with a push button attachment by means of which an electric bell or annunciator may be rung, and to provide an arrangement whereby the electric bell may be rung if the knob of the box is tampered with.

BIT-BRACE.—C. R. Cousino, Crescent City, Cal. The objects of the present invention are: To provide an implement which quickly and easily may be converted from a carpenter's brace for use with a bit, to a gear-driven breast drill; and to simplify the construction so that the disadjustment of the parts is minimized.

MOUNTING FOR CASTER-WHEELS.—J. Sharon, Canaseraga, N. Y. This inventor provides a mounting which may be placed in an operative and inoperative position successively, and held in each position securely; provides a mounting which may be quickly and readily adjusted to form a solid bearing for the caster; and provides a mounting durable and of economical construction.

HORSE-COLLAR FASTENER.—A. J. Daine, Pratts Fork, Ohio. The aim in this instance is to provide a fastener by means of which the collar can be expeditiously secured in position upon the animal, and be easily released to permit the removal of the collar, without a loss of time, and labor, and in which the parts are securely held together when joined against accidental release.

HAND-TRUCK.—T. C. Fredericksen, Astoria, Ore. This invention provides a braking device for hand trucks which will automatically operate on downwardly inclined surfaces; automatic devices for hand trucks which are graduated in their operation in conformity with the position of the body of the truck relative to the ground, and to simplify and economize the construction of the truck.

Heating and Lighting.

SUCTION-NOZZLE FOR DUST AND ASH REMOVING DEVICES.—E. Pannenborg, Syracuse, N. Y. The purpose of this inventor is to provide a dust and ashes suction nozzle and its combination with air exhausting means, which enable the speedy and thorough removal of fine ashes from the ash pit of a furnace or the like, and the transfer of such material to a point of discharge.

MEANS FOR FACILITATING THE REMOVAL OF ACCUMULATIONS IN THE PIPES AND ELBOWS OF FURNACES.—E. Pannenborg, Syracuse, N. Y. The intention in this case is to provide openings in the hot-air conveying pipes and draft pipes of hot-air furnaces, and novel means for closing such openings so as to prevent leakage; and further to provide similar openings and closures for the elbows of the draft and hot-air pipes for air heating furnaces.

MINER'S CANDLESTICK.—A. B. Sharp, Boise, Idaho. The purpose here is to provide a candlestick which can be suspended from a suitable support, which can be driven into a wall or the like to hold it rigidly in place, which has means for securely holding the candle, and the parts which are removably held together to permit the candlestick to be taken apart.

CHIMNEY.—J. D. Warren, New York, N. Y. The invention refers to chimneys adapted for use with liquid or gaseous fuel burners, and more particularly to chimneys for gas burners with which incandescent mantles are employed. The object is to reinforce and strengthen the base portion of the chimney and provide means whereby air may gain access to the interior thereof to support combustion.

Household Utilities.

BOOK-RACK.—E. Oldenbusch, New York, N. Y. In its preferred form, the improved rack has two separate end plates foldable into engagement with the base, and this base is formed of telescoping members relatively movable to vary the total length of the rack. The object is to render the rack simple and durable in form and approximately all of the parts of sheet metal.

MATTRESS.—A. T. Quick, Lynchburg, Va. This ventilating device for use in mattresses comprises a tube provided near one end with a circumferential series of openings, a button having a channel receiving such end of the tube, and also provided with inner and outer spurs bent from the inner and outer sides of the tubes through the openings therein and a gauze cover within the ring and held by the spurs thereof.

FASTENING DEVICE.—Mary O'Donovan, New York, N. Y. The device is more especially designed for use on ironing boards to permit the user to conveniently and quickly fasten the cloth cover in place on the ironing board, or to remove the same from the board for cleaning, renewal or other purpose, the device permitting the user to properly stretch the cloth cover and to hold it in a stretched position.

BED-RAIL FASTENER.—F. W. Merriweather, Kansas City, Mo. Generally speaking, this invention consists of a rail having a head secured thereon, a bolt secured in the head, said bolt being adapted to engage a slot or socket in the end of the bed, and a wedge adapted to cause the bolt to secure the rail and the end tightly together.

Machines and Mechanical Devices.

ROLLER-BEARING.—J. Ramslie, San Mateo, Cal. The invention relates more particularly to that type of bearing in which are provided two bearing members or racings separated by a plurality of rotatable load-supporting members, and in which those members are spaced apart by intermediate rotatable spacing members. Means provide whereby the rotatable spacing members will have rolling rather than sliding engagement with every part with which they connect.

ROAD-GRADING MACHINE.—B. Whittemore, Albert Lea, Minn. The object here is to produce an implement which is simple and can be readily operated so as to grade a road. The general structure is such that the material of the road-bed is scraped from the sides and brought inwardly to the middle portion or crown of the road. Means provide particularly for adjusting the parts and controlling the distribution of the road material.

EXPOSURE ATTACHMENT FOR PHOTOGRAPHIC-PRINTING MACHINES.—E. N. Kerr, Rock Island, Ill. The machine enables the operator to adjust the time of exposure, incidental to the photographic printing with a high degree of accuracy. It automatically cuts off the light and thus ends the exposure of the paper or other article being printed.

PACKAGING-MACHINE. — R. Hoyt, New York, N. Y. This invention refers to machines for packaging more or less finely divided materials, its principal object being to provide such an apparatus in which the operations of forming an envelop or wrapper, supplying the contents, and closing and delivering the package are continuously and automatically carried out.

GAGE FOR SEWING-MACHINES.—J. L. Kleinman, New York, N. Y. The object of this inventor is to provide a gage for use on the presser foot of a sewing-machine, and arranged to insure accurate guiding of the fabric material with a view to locate the row of stitches the desired distance from the edge of the fabric material or parallel to a previous row of stitches.

PUMP.—T. J. Johnson, Norman, Okla. In operation the straight arms move the pistons in the cylinders, and the weights on the respective sides of the frame are so proportioned, that when one side moves downward, its weight of water serves as power to lift the water on the other side.

WATER-MOTOR.—C. A. Whelan, Buena Vista, Colo. The casing of this device with the rotor in place, is arranged in the current, or the path of the movement of the waves, with the inlet end up stream. The water flowing strikes the blades, and since they are arranged at an angle to the lines of force exerted by the current, they are deflected to one side, thus imparting a rotation to the casing, which movement is transmitted by the shaft to the mechanism to be operated.

POCKET CASH-REGISTER.—K. Schaub, Kansas City, Mo. In carrying out this invention Mr. Schaub provides a number of wheels, upon the margin of which are certain figures representing monetary values. These wheels are operated by means of a series of rods or plungers and when so operated are turned to register the amounts expended, such registerings appearing in openings in the casing of the device.

SAWMILL SET-WORKS.—E. Johnson, Potlatch, Idaho. The object here is to provide improvements whereby the operator is permitted to automatically control the head block knees wholly independent of the main set mechanism, and with a view to move the head block knees toward or from the saw and to stop the knees accurately in the desired position.

CONTROLLING DEVICE.—R. V. English, Alpena, Mich. This invention relates to pulp or paper machines, and the object is to provide a device for use in controlling the flow of pulp into the paper machine with a view to supply the latter with the proper amount of pulp for the correct working of the machine, and to insure a steady flow of the pulp without danger of clogging.

APPARATUS FOR REMOVING SAND AND OTHER FINE PARTICLES FROM COTTON OR OTHER MATERIALS.—F. B. Cumpston, Dallas, Texas. In the present patent the invention is an improvement in apparatus for use in removing sand or other fine particles from cotton or other material by air suction, and has in view an effective means to separate the particles from the inflowing current of air before the latter reaches the suction fan or air pump.

SHIFTING-RACK BED MOVEMENT.—C. Backer, Plainfield, N. J. One of the objects in this improvement is to provide a device in which the reciprocating movement is effected by a driving gear which is located on a stationary shaft and which is rigidly secured thereto, the mechanism having far greater durability than in similar devices in which the driving gears are shifted with respect to the shaft.

Prime Movers and Their Accessories.

STEAM-TRAP.—G. Keisling, Scranton, and J. D. Brown, Dunmore, Pa. The invention relates to traps which are adapted to be introduced into steam distribution systems, for the purpose of collecting the condensed steam and discharging the water when a sufficient amount has been collected. An object is to provide a steam trap capable of forcing the water to an elevated position.

FRAMEWORK FOR TURBINES AND GENERATORS.—J. P. Nickonow, Evansville, Ind. The invention pertains to generators and to turbines for driving the same, the more particular purpose being to provide a suitable framework by aid of which the turbine, the generator and various parts associated with the same, are readily combined into a single machine of compact form.

IGNITER.—O. Pearson, Worcester, Mass. In this engine the crude ore or other fuel is delivered directly to its interior and is vaporized by the heat remaining from the last prior explosion. Fuel is admitted simultaneously with the air, and the liquid strikes upon a heated baffle plate below the inlet plate. To facilitate the latter's heating and to avoid interference with the working of the valves, the plate is supported preferably upon the igniter.

Railways and Their Accessories.

CAR-FENDER.—J. L. Smith, Rockville, Conn. The object of this inventor is to provide a car fender more especially designed for use on street cars and arranged to run very close to the rails, with a view to rapidly pick up persons or other obstacles in the path of the car. A is pivoted at its rear end to a

cross bar mounted on the car, and its front is provided with inclined guiding and supporting wheels engaging the inner side of the rails.

PASSENGER STRAP-HANGER. — W. B. MCCARTHY, Milford, Conn. To overcome many objections, the hanger is constructed of non-absorbent material, as metal, the same embodying a bar body having one or more advertising faces and provided with detachable end members, one of which is provided with suspending means and the other with a hand-hold. A bar having one advertisement may be substituted for another, without discarding the entire hanger.

RAILOGRAPH.—J. H. MILBURN, Baltimore, Md. The invention is in the nature of a pantograph adapted for application to the heads of railroad rails for ascertaining and recording their transverse contour or form upon a suitable scribing surface. This is performed by railroad companies at regular periods for the purpose of finding the wear and distortion of rails, and more particularly the heads and upper portions of the webs thereof.

CAR-SEAL.—E. G. GEBAUER, Chicago, Ill. The improvement refers to a seal to be used to secure the doors of a railway freight car or the like, so that they may not be opened without becoming known. The aim is to provide a device cheaply manufactured, and which may serve as a sure preventive of tampering without detection.

AUXILIARY CAR-STEP.—W. O. DALY, Mobile, Ala. In the present patent the object of the inventor is the provision of an auxiliary car step which, when not in use, will be folded neatly and inconspicuously against the bottom of the fixed steps and which may be easily moved into operative position from the platform of the car.

MAIL-BAG CATCHER AND DELIVERER.—C. H. ANTHONY, St. James, Mo. The purpose here is to provide a device which will operate so as to take mail from a passing train, and deliver a bag of mail to the train simultaneously. The construction is such as to facilitate the delivering or catching of more than one bag of mail if desired.

SLIDING-DOOR ASH-PAN.—H. ALAMAN and W. MCC. LINDLEY, Terre Haute, Ind. The improvement is in sliding door ash pans. The object of the invention is the provision of an ash pan especially adapted for use with locomotives, wherein the doors are slidably mounted and movable in the same horizontal plane, and operated in unison by a common operating means.

Pertaining to Recreation.

AMUSEMENT FLYING-MACHINE.—R. G. DRESSLER, New York, N. Y. The invention is of that type in which a suitable machine containing pleasure seekers is traversed between a starting and a receiving station, being suspended by its own sustaining power intermediate the stations. The machine may be reversed. It may be given an upward throw as it leaves the starting rail. It is provided with means to traverse between a starting and a receiving station in either direction.

FISHING APPARATUS.—C. G. JORGENSEN, Chicago, Ill. This invention pertains to fishing and trapping, and provides an apparatus for use in rowboats, rafts, power boats and the like, and arranged to provide a means for suspending one or more fishing lines in the water at a safe striking distance from the boat and without unduly obstructing the interior of the boat.

GAME-COUNTER.—A. MCKINNEY, Alpine, Texas. The intention in this instances is to provide a device for use in scoring the points as they are made and to keep a register of the number of games played, the returning of the counters proper to their original position after each game, operating the game recording mechanism.

AMUSEMENT DEVICE.—G. A. ROSQUIST, New York, N. Y. The special purpose here is to so mount the cars or seats in respect to their axes, that they may have not only a rotating but a radial movement. The latter may be brought about by special mechanical means but preferably upon centrifugal force. The speed and time of radial movement are preferably controlled by varying the angle of the axis about which the car rotates, in respect to the main central axis.

Pertaining to Vehicles.

VEHICLE-TIRE.—W. W. SCOTT, Hampton, Va. This invention refers to tires for emergency purposes. An object is to provide a tire which may be carried with the vehicle, and which may be slipped on in lieu of a damaged tire, so that the vehicle may be drawn back to the place where the damaged tire may be repaired.

Designs.

DESIGN FOR A TRIMMING.—D. F. WEYL, New York, N. Y. In this case the strip of trimming comprises an ornamental design wherein the chief figure represents dominos stretched in oblique directions along the strip and between the spaces three stars are clustered in a triangle form.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of March 13th, 1909, or will be sent by mail on request.

(12219) C. F. L. says: 1. It is stated in textbooks of physics that of two colliding inelastic balls of masses m_1 and m_2 and velocities of v_1 and v_2 the velocity of their common mass after colliding will be represented by

$$V \text{ (common velocity)} = \frac{m_1 v_1 + m_2 v_2}{(m_1 + m_2)}$$

But the equation

$$(m_1 + m_2) v^2 = m_1 v_1^2 + m_2 v_2^2$$

does not hold in most cases upon giving the quantities m_1, v_2, etc., numerical values. In other words, there appears sometimes to be a gain of kinetic energy, which is contrary to the law of conservation of energy. It is asserted that if you transfer the momentum of a ball, weighing say 100 g., to a ball weighing 200 g. the heavier ball's velocity will be half that of the lighter, the momentum of each being the same. But their kinetic energies will not be the same, for (supposing velocity light ball 10 cm. sec.) $100 \times (10)^2$ does not equal $200 \times (5)^2$, but is just twice as great. A. You do not give your address, which is very essential, according to the rules of our Notes and Queries column. Your queries would also come within what might be called "an examination paper." Fortunately your queries happen to be more or less of interest generally, therefore we have taken the trouble to answer the same. We wish correspondents to understand, however, that we will not make a practice of answering miscellaneous queries of this nature which do not appear to be practical to themselves. It required over two hours to answer this query, and those who wish answers of this kind should expect to pay at least $3 for the same. Here follows the answer: When two bodies collide and after collision move on together, their velocity after collision is determined as you state. It is a matter of momentum. The kinetic energy is a matter of mass and velocity and varies as the square of the velocity. It will be affected more by the change of velocity than the momentum is. 2. It is claimed that the vapor tension from a concave surface of a liquid is less than from a plane surface and that this is in some way connected with the phenomena of cohesion. Kindly explain. A. We cannot discuss the relation of shape of the surface of a liquid to its vapor pressure, as we have not followed out any experimental work in that line, and would suggest that you take up the matter with the original investigators, whose opinion would be of value. 3. Why is the melting point of ice lowered by pressure? A. All liquids which expand upon freezing may be melted by compressing them in the solid condition into the volume which they had before they solidified. Liquids which contract upon freezing cannot be melted by compression, since this only brings the molecules still nearer together. To melt them they should be expanded. If a liquid which expands upon freezing is prevented from expanding it cannot freeze, since its molecules cannot move any farther apart, as they must do to turn into the solid form. 4. What are the properties of gas as liquid at the critical point as regards density, latent heat of vaporization, etc.? A. We are not able to find any figures as to the heat of vaporization for any substance at the critical temperature. The liquid expands as it is heated to the critical point. Its density is therefore diminished; its vapor in the space above the liquid becomes more dense. At the critical point the two meet in density and an insensible change takes place. If more heat is applied the liquid disappears and the whole becomes a vapor. Duff, Physics, page 245, says: "It is idle to ask if the homogeneous fluid is a liquid or a gas. . . . The continuity of the inclosed mass has never been broken. We can distinguish the two states only when the temperature is below the critical. You may find the density for several substances at the critical points given in the Smithsonian Physical Tables, page 200. 5. Is the phenomenon of a gas escaping through a small hole without friction to be regarded as a molar or molecular phenomenon? A. If the opening through which a gas is escaping is larger than a molecule, the escape of the gas is a phenomenon of a mass. 6. What is meant by the word entropy? A. In the Century Dictionary you may find the following definitions of Entropy: "As used by Clausius, the inventor of the word, and others, it is that part of the energy of a system which cannot be converted into mechanical work without communication of heat to some other body or change of volume. As used by Tait and others it is the available energy or that part of the energy which is not included in the first definition." Clerk Maxwell defines as follows: "The entropy of a system is the mechanical work it can perform without communication of heat or alteration of its total volume, all transference of heat being performed by reversible engines." For fuller definition see Watson's Physics, pp. 339-345. Price $1. 7. Would it be possible to hold a copper or silver coin suspended in air by means of a powerful magnet by virtue of eddy currents? A. Copper and silver are not attracted by a magnet in the slightest degree. 8. Why does the heat of vaporization increase as the temperature of the evaporation liquid is lowered? A. We are not able to explain why the heat of evaporation increases as the temperature of a liquid is lowered, unless it be due to the fact that the liquid is further from its vapor condition at the lower temperature. 9. What is the best way to make a glass vessel chemically clean? A. Glass is cleaned by the action of nitric acid, potash and distilled water in succession.

(12220) T. H. calls our attention to an error which he made in Query 12217, in using the radius of the moon's orbit where he should have used the diameter, as a basis of his calculation. This is true. We did not notice his error in reading his letter probably because we did not suppose any one would make such a mistake. If this correction is made the orbit of the moon becomes twice as long and the rest of the calculations can be corrected accordingly.

NEW BOOKS, ETC.

FINANCIAL ADVERTISING. For Commercial and Savings Banks, Trust, Title Insurance, and Safe Deposit Companies, Investment Houses. By E. St. Elmo Lewis. Indianapolis: Levey Brothers. Pp. 992.

Mr. Lewis is peculiarly competent to write a book upon advertising for the simple reason that the better part of his life has been identified with advertising, and particularly with the advertising of a certain adding machine which is much used in banking institutions. The work before us represents the fruits of wide experience in what the author calls "financial advertising," and contains a fund of information which may well be applied to other kinds of publicity. Beginning with a brief history of advertising, in which the town crier and the auctioneer and what might be called primitive advertising come in for their share of comment, the author plunges into a second chapter on the banker's duty to the public, a subject which may apparently have very little to do with advertising to the casual reader, but which has a direct bearing upon banking publicity because of the intimate relation of banking to the people. Of wider use perhaps, and therefore more valuable to the advertiser, is the chapter on "How to Reach the People." Here indeed Mr. Lewis is in his element, for he gives many an excellent concrete example of what good advertising means, how it is conceived, and how a scheme is carried out. The essentials of good advertising are discussed under the various headings of "Attracting the Attention," "Awakening the Interest," and "Creating Conviction," all of them decidedly essential, as every modern advertiser knows. The relative values of local newspapers, magazines, street-car advertising, advertising novelties, booklets, folders, house organs, circular and form letters, etc., are thoroughly compared.

We would comment particularly on Mr. Lewis's book as to its essentially practical character. He even discusses the value of printing, the advertising manager and his work, the function of the publicity promoter, and the peculiarly special problems which confront savings banks, trust companies, and stock brokers.

BROAD LINES IN SCIENCE TEACHING. Edited by F. Hodson. With an introduction by M. E. Sadler. New York: The Macmillan Company, 1910. 267 pp. Price, $1.25.

If anyone needed evidence of the many-sided view of science in modern education, he would surely find it in this admirable collection of essays edited by Drs. F. Hodson and M. E. Sadler. In furtherance of the Editor's object to achieve through a variety of essays an adequate notion of the requirements which in the ideal case should be satisfied for boys in secondary schools, the various essayists who have contributed to this volume have carefully examined the claims of rival departments of scientific study and the various methods of teaching. The essays of which the book is comprised are the following: The Place of Science in the School Curriculum, The Scope of Nature-Study, The Teaching of Nature-Study, Biology in Schools, The Teaching of Hygiene, The Place of Hypotheses in Science Teaching, The Claims of "Research" Work and Examinations, School Mathematics in Relation to School Science, Co-ordination of Physics Teaching in School and College with Special Reference to Electricity and Magnetism, Geography, Science in the Teaching of History, Economic Science in Secondary Schools, Domestic Science, The Teaching of Chemistry in Technical Schools, How the School May Help Agriculture, Engineering, Science Teaching and the Training of the Affections, Science Teaching and a Child's Philosophy, The Present Condition of Physics Teaching in the United States, School Science in Germany, Some Practical Notes on the Planning of Science Laboratories.

THE PROLONGATION OF LIFE. Optimistic Studies. By Elie Metchnikoff. New York: G. P. Putnam's Sons, 1910. 343 pp. Price, $1.75 net.

Prof. Metchnikoff has been very much in the public eye of late years because of his bacteriological investigations of senility. As a result of his widespread teaching that the comparative shortness of human life is to be attributed largely to the enormous length of the human intestines and the putrefaction of food therein, the fermented milk industries have received a new impetus; for in the bacterin of fermented milk Prof. Metchnikoff finds those counteracting agents which stop putrefaction and thus lengthen human life. The theories advanced in the present volume do not differ from those advanced in his previous volume on the same subject. Metchnikoff offers for the treatment of old age a method of nutrition which he believes will diminish the danger to old persons from being attacked by those diseases to which they are especially liable. The book, however, is more than this. To a certain extent it presents Metchnikoff's views as to the conditions of life and the objects of existence. It is not a perfectly reasoned out philosophy, nor is it based upon anything but purely physiological research. Yet it is a very real and very important contribution. The book is divided into the following parts: The Investigation of Old Age, Longevity in the Animal Kingdom, Investigations of Natural Death, Should We Try to Prolong Human Life? Psychical Rudiments in Man, Some Points in the History of Social Animals, Pessimism and Optimism, Goethe and Faust, Science and Morality. After reading this book one feels that cheerful optimism is one of Metchnikoff's temperamental qualities.

THREE RIVERS. The Hudson, The Potomac, The James. A Retrospect of Peace and War. By General Joseph P. Farley, U. S. A. New York and Washington: The Neale Publishing Company, 1910. Illustrated with ten sketches from nature by the author in water colors, reproduced in color. 8vo.; cloth handsome letterpress and binding. 277 pp. Price, $2 net.

The author of this work, who, though a Southern man by birth and affiliation, fought for the Union in the civil war, is known throughout the world as an ordnance expert, and he was one of the designers and constructors of the army 16-inch rifle, the largest type of gun extant to-day. After more than half a century of service in the army, he writes this delightful retrospect of peace and war, a record in which anecdote, history, biography, observation, and experience—books, battles, soldiers, picture, theories, men, and things—are happily mingled. He has selected for his memory pictures the three rivers more intimately connected with his life. Along the banks of the James he recalls his boyhood and early manhood, many battles of his fighting days, and the contest of the ironclads in Hampton Roads. On the Potomac he recalls many famous homes of famous families, and recounts the inner history of such battles as Bull Run, Malvern Hill, and Gettysburg. Finally he describes the old and the new West Point of the Hudson, this part of the book being replete with interesting biographical sketches relating to that historic center.

SCHLEY, SAMPSON, AND CERVERA. By James Parker, formerly Lieutenant Commander, U. S. N. New York and Washington: The Neale Publishing Company, 1910. 333 pp.; 9 illustrations. Price, $2.

This work, which is a review of the naval campaign of 1898, in pursuit and destruction of the Spanish fleet commanded by Rear Admiral Pascual Cervera, is a contribution to the literature of the famous Sampson-Schley controversy. But it is much more than that, inasmuch as the author gives a very complete and consecutive account of the various naval activities both in Washington and on the high seas connected with the memorable Spanish war. While the author admits that it will be evident to the reader that his professional, legal, naval, and personal judgments are favorable to Admiral Schley, he has made it his aim to do full justice to every other officer concerned, being prompted to this by the fact that he still regards them as his "professional brethren." He states that the book has been written without any consultation with Admiral Schley, "who has never seen a line of it, and does not know that it has been written." The work is published in the hope that a careful reading of the review will dispel all misunderstanding of that campaign, "a misunderstanding which has pertinaciously been promulgated in the effort to convey false impressions with regard to the principal actors in it." The work is so written that it should certainly put the reader in a position to judge for himself of the actual merit of the campaign. It is to be hoped, however, that with the publication of this work we have heard the last of this unfortunate controversy.

DIE HEISSDAMPF-SCHIFFSMASCHINE. Eine Sammlung von Erfahrungsangaben für die Berechnung der Abmessungen und des Dampfverbrauches, sowie des Kohlenverbrauches der Schiffmaschinen für Heissdampfbetrieb. Von Carl Fred Holmboe. Berlin: Wilhelm Ernst & Son, 1910. Price, $1.50.

STENOGRAPHER AND EMPLOYER. By Fessenden N. Chase. Portland, Me.: Press of Southworth Printing Company, 1909. 86 pp. Price, $1.

Legal Notices

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How Railway Traffic is Managed.

BY C. C. RICE.

Almost everybody knows something about railroad rules, but very few, unless holding or having held some railroad position, have a clear idea of just how many precautions are taken to prevent accident.

Whenever a big wreck occurs, through error in train orders, oversight of a telegraph operator, engineer, conductor, or flagman, the newspapers usually give one cause and blame one person, when more than likely two or three are equally to blame.

The rules of course vary to some extent on the different systems, but those explained in this article are near enough standard to give the reader a clear insight into just how many things must go wrong before a collision can occur. The road in mind has part single and part double track, uses the telegraphic block system on the single track and automatic electric block on the double track. The rule book, which is the railroad man's Bible, is a little book not much larger than a post card, one-quarter inch thick, and contains only 120 pages. All changes and special instructions are issued in the employees' time table, which contains the schedule time of every train at all stations. This time table divides the trains into four classes, passenger trains being first class, time freights second class, and so on. It also gives eastbound trains right over west-bound trains of the same or an inferior class, so an east-bound first-class train has right over all trains and pays no attention to any schedule but its own, while a west-bound first-class train is superior to everything except a first-class train east-bound, but has to take care not to encroach on the schedule time of any first-class east-bound train. A poor fourth-class train westbound is inferior to everything; and when on consulting his watch and time table the conductor finds some higher class train nearly due, it has to dodge into a side track, allowing a first or second-class train to run ahead, or to meet a first, second, third, or fourth-class train. Now, if trains never got late, watches never went wrong, or train crews never looked at their own or other schedules wrong, trains could move along just on their time-table rights, as their schedules are so figured that they meet, pass, and are passed at certain stations and certain times. But some things will go wrong. So as an additional precaution the dispatcher issues train orders telling them where to meet and pass, giving inferior trains orders that some superior train is running late, where to run slow on account of bad track reported by track walkers, and in every way trying to save delay and insure safety.

These train orders are sent to all trains and stations concerned at the same time, and are not delivered to any train until all copies have been correctly repeated. When a train order increases the time-table rights of a train, it may be handed up to the moving train; but when it restricts these rights, the train crew has to stop and sign for the order. The telegraph operator is required to set all block and train-order signals at danger, and so notify the dispatcher before he copies a train order, and must not change these signals until the order is delivered; or if the order is for trains to meet at his station, his danger signal must remain displayed until the meet has been accomplished.

In addition to running by train orders and schedule, a block system is operated independently. At every station is one tall pole, called a semaphore, on which signals are displayed. The space between two of these semaphores, usually three or four miles, is called a "block." Now, under absolute block rules, no two trains can occupy the same block at one time. The block signals on the semaphores stand at danger all the time, and are never clear except when held in this position by the operator. A train before

proceeding is required to see this signal change from danger to clear.

At all stations a record is kept showing the departing time of every train at this station and at the next station east and west. Supposing a west-bound train to be approaching a station semaphore. The telegraph operator, if he has no orders on hand for this train to meet anything at his station, consults his block record, and if the block west is clear he calls up the station west, and obtains permission to let a train in the block. He then pulls his block signal clear and holds it in this position until the train is by, immediately reporting it to both block stations and the dispatcher.

If a train from any cause has to stop between stations or finds itself on the schedule time of a superior train, it has to flag, putting down torpedoes and sending a man with a red flag ahead and back, notwithstanding the knowledge that the telegraph operator will not let another train enter the block until it is clear.

Now, on double track things are very much simplified, as all trains going in one direction move on the same track, and only have to take siding to allow a train of higher class to run ahead. This allows the use of automatic electric block signals placed at intervals of about a mile; all signals being on the right-hand side of the track which they govern. At every one of these signals the joints between the rails are insulated, thus cutting the tracks up into blocks between the signals. These signals are so wired that when a train approaches one of them, if the block ahead is clear, the circuit will be completed from one rail to the rail on opposite side of track through the wheels of the train, causing the signal to come clear, in which position it stands until the engine passes it. If one of these signals fails, the train is required to wait a minute or two, long enough to allow a preceding train to clear the block or to flag, and then proceed with caution to the next signal, reporting the failure at first office.

These automatic signals work over two thousand times to one failure, and are so constructed that a failure leaves the signal at the danger position.

Estimation of the Working Capacity of a Man Before and After an Accident.

The problem of determining the working capacity of the victim of an accident is divided into two parts. It is necessary to establish, first, the condition in which the accident has left the various organs and functions of the body; and secondly, the effects of the consequences of the accident upon the power to work, either at the victim's previous occupation, if he is able to continue it, or at such other occupations as he may be able to carry on. Dr. Imbert in a recent article criticises the methods generally employed for the solution of this problem. The attendant physicians and the medical experts give only their personal opinions, instead of employing the exact methods of examination which are used in physiological laboratories. Thus in many cases, in which the statements of the victim appear false or exaggerated, the truth could easily be ascertained by the use of X rays or by the electric exploration of the nerves and muscles. Dr. Imbert describes various researches which he has made in the physiological study of certain occupations. He thinks that it is possible to arrange a mass of useful data in a form in which they would be available for the decision of individual cases.

That apparently most remote of the sciences from the exactness of physical laws, economics, has been brought under the treatment of mathematics, not only by statistical methods, but by methods of the calculus. The distinguished mathematician and economist Cournot applied to the theory of wealth methods like those used in mechanics to treat of equilibria, so that very complicated economic principles were amenable to treatment by symbols.

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Harrow, drag, and pulverizer, W. B. Mitchell	953,792
Harrowing of the ground, mechanism to lift the drags during the, W. von Tecklenburg	953,709
Harvester, B. Holt	954,394
Harvesting machine cutter, J. H. Wilson	954,099
Hat fastener, R. Daboul	954,078
Hat pins, etc., safety attachment for, G. Hofmann	954,287
Heald shaft for wire and metal healds, H. B. Barlow	954,013
Hides, skins, or leather, machine for treating, W. A. Wust	953,937
Hoist, fluid actuated balanced, G. F. Steedman	954,401
Hoisting apparatus, multiple, A. M. Coyle	954,022
Hoisting bucket, bottom dumping, A. N. Doud	954,200
Hopple, G. Chambers	953,818
Horseshoes, apparatus for manufacturing, C. E. Pedersen	953,759
Hose coupling, F. G. Schaefer	954,348
Humidor, L. Kahn	953,841
Hydrocarbon burner, S. L. Davis	954,380
Hydrocarbon furnace, A. O. Bradford	953,685
Ice cream cone dipper, A. J. Daniel	953,901
Ice cream freezer, G. W. Foillon	954,411
Ignition apparatus, E. Eisemann	953,990
Ignition trouble finder, E. T. Cable	953,770
Index or directory, D. T. O'Sullivan	954,334
Indicator, H. A. Raedeker	953,702
Indicator, E. Pearson	954,338
Induction motor, R. B. Williamson	953,869
Ingots and other castings, apparatus for making metal, R. A. Hadfield	954,183
Inkstand, C. C. Miles	953,917
Insulator, A. J. Siller	954,350
Insulator protecting apparatus, L. C. Nicholson	954,299
Internal combustion engine, E. C. Richard	954,208
Invalid raising and moving device, C. W. Lane	953,962
Ironing board, T. A. Davis	954,261
Ironing board, F. V. Shampine	954,349
Irrigation system, Sweeney & Kennedy	954,059
Keg rinser, A. C. La Budde	954,397
Key extracting device, A. T. Rowe	953,923
Kiln, E. Anderson	954,243
Knitting machine needle, J. C. Egly	954,174
Labeling machine, can end, L. W. Earl	953,944
Lamp, electric arc, J. Rignon	953,859
Lamp, gas, F. J. Humphrey	953,835, 953,836
Lamp, gasolene, A. B. Lee	952,913
Lamp shade, A. H. Hoag	953,950
Lamp socket, incandescent electric, J. K. Lux	954,117
Lamp, vapor, M. Galvao	953,966
Lamps, lock guard for incandescent, H. Hubbell	953,834
Lamps, vaporizing and igniting means for hydrocarbon, Y. Kawasaki	953,748
Land roller, E. S. Wilder	953,771
Lantern, reflecting, N. H. Brown	954,408
Lasting machine, L. B. Stamm	954,355
Latch, door, W. A. Mooney	954,324
Latch, gate, L. Cosgrove	953,889
Launching apparatus, C. Hunt	953,894
Lawn trimmer, A. C. Warner	953,876
Leather finishing machine, variable speed rolls, W. R. Smith	953,980
Lens attachment, F. U. Williams	953,879
Letter case label for postal cars, H. C. Hoffner	953,907
Level, spirit, Bodmer & Burdick	954,074
Line casting machine, G. D. Hartley	953,745
Line check, W. H. Fowler	954,178
Linotype machine, J. R. Rogers	953,764
Loading apparatus, J. Nichol	954,328
Loading device, vehicle, R. C. Miner	954,198
Lock. See Door lock.	
Lock, F. B. Watts	953,874
Lock movements, spring box for time, C. A. Miller	954,323
Locomotive ash pan, Ennis & Ball	954,274
Locomotives, sand distributer for, H. B. Wasem	954,223
Loom, needle, C. Vorwerk	953,770
Loom shedding mechanism, A. A. Gordon, Jr.	954,181
Loom shuttle changing mechanism, O. Conserat	953,779
Loom take-up mechanism, B. F. McGuiness	954,127
Looms, cloth guiding means for, Gustafson & Duquette	953,896
Lumber and veneer drier, thin, J. A. McDougall	954,041
Mail box, A. F. Martel	954,037
Mail hook, J. Hammond	953,829
Manhole cover, sewer, Rice & Pendergast	953,858
Manicuring instrument, G. W. Moore	954,325
Manifolding device, G. F. Hutchings	954,102
Manure spreader, E. E. Rowley	954,137
Massage apparatus, R. H. Gay	954,083
Mattress, F. J. Hecht	954,284
Measuring device, ribbon and cloth, H. T. Quandahl	953,840
Measuring instrument, Z. R. Tucker	953,933
Measuring loads, apparatus for, E. De Lorenzi	954,282
Meat bonding implement, H. Gelbman	954,084
Mechanical movement, R. Lindner	954,116
Merry-go-round, J. D. Walsh	953,808
Metal band, J. A. Gray	954,093
Metallic tie and rail fastener, W. H. Chamberlain	954,254
Meter. See Dry meter.	
Milk can, E. M. Kimball	953,844
Milking vessel support, S. W. Gerster	953,994
Milling machine attachment, J. R. French	953,904
Mining drill, G. W. Nixon	953,855, 953,989
Mold, W. M. Sheppard	953,926
Mold, P. H. Allison	954,568
Mold for collapsible metal centerings, S. I. Sheets	953,925
Molding machine, R. S. Buch	953,894
Mosquito net frame, E. L. Moffitt	953,965
Mowers, grass elevator for horse lawn, T. Spencer	954,007
Mowing machine, M. G. Otis	953,757
Mowing machine cutter bar, Poole & Abbenzeller	953,711
Muffler, H. J. Cordle	953,776
Music rack, J. Sweeney	954,358
Music turner, automatic, M. L. W. Wilson	954,236
Neckwear, F. K. Blanchard	954,017
Nest, hen's, S. M. Hixson	953,785
Numbering machine, R. F. Conrad	953,819
Nut, frictional lock, W. F. Kenney	954,304

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

READ THIS COLUMN CAREFULLY.—You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. **In every case it is necessary to give the number of the inquiry.** Where manufacturers do not respond promptly the inquiry may be repeated.

MUNN & CO., Inc.

PATENTS FOR SALE.

FOR SALE.—U. S. patent, automatic time cut-off for individual electric lights. Needed wherever electricity is used for lighting. Will submit particulars and samples to those interested. Paul Dixon, 47 Whitehall St. Atlanta, Ga.

Inquiry No. 8818.—For manufacturers of "Wydt's Electro-Catalytic Sparking Plug."

HELP WANTED.

LOCAL REPRESENTATIVE WANTED.—Splendid income assured right man to act as our representative after learning our business thoroughly by mail. Former experience unnecessary. All we require is honesty, ability, ambition and willingness to learn a lucrative business. No soliciting or traveling. This is an exceptional opportunity for a man in your section to get into a big paying business without capital and become independent for life. Write at once for full particulars. Address E. R. Marden, Pres., The Nat'l Co-op. Real Estate Co., Suite 358, Marden Building, Washington, D. C.

Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power meters.

MECHANICAL SUPERINTENDENT to take charge of large machine shop. Apply stating experience and salary expected. Superintendent, Box 773, N. Y.

Inquiry No. 9014.—For manufacturers of machinery, supplies, etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

EXPERIMENTAL ENGINEER wanted, by a large manufacturing concern having technical and practical knowledge of mechanics and preferably chemistry as well. Must possess special aptitude for this character of work. Address in confidence with full particulars, including salary expected. Business Service Co., 305 Broadway, New York.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9023.—Wanted, to buy silk machines from re-reeling, twisting, doubling, to the final process of making it into clothes.

SALE AND EXCHANGE.

FOR SALE.—Engine lathe. Our regular $75.00 lathe complete, with a face plate, two centers, wrenches and a full set of change gears to cut all size threads. Price only $45.50. L. F. Grammes & Sons, Allentown, Pa.

Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9038.—Wanted, the address of the Chipman Electric Purifying Co.

Inquiry No. 9042.—Wanted the address of Farney Safety Razor Co.

Inquiry No. 9053.—Wanted, address of firms who install plants to manufacture nitrogen.

Inquiry No. 9055.—Wanted, address of parties interested in Log Cleaning Machines.

Inquiry No. 9060.—Wanted to buy machinery to manufacture seed corn racks.

Inquiry No. 9066.—Wanted complete outfit for export for making rice-flakes and wheat-flakes.

Inquiry No. 9069.—For the address of firm making chain cloth, something like ladies' purses are made of.

Inquiry No. 9071.—Wanted, the address of parties making moulds for large concrete vases for flower pots.

Inquiry No. 9073.—Wanted, machinery to manufacture cocoanut oil; also the crude material.

Inquiry No. 9074.—Wanted, to buy old model locomotives or steamboats, such as were exhibited with nickel-in-the-slot attachments in ferry-houses, etc.

Inquiry No. 9075.—Wanted, to buy small weather vanes, such as can be used as ornaments on lightning rod tops. Aluminum preferred.

Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

Inquiry No. 9077.—Wanted, the address of manufacturers that make small articles of wood, such as checker boards, etc.

Inquiry No. 9078.—Wanted, the address of manufacturers of sewer pipe, made of fiber and asphaltum, suitable for laboratory use.

Inquiry No. 9079.—Wanted, parties to make a special steel plate rolled for "angle bars," in large quantities.

Inquiry No. 9080.—Wanted the address of parties manufacturing paste-making machinery.

Inquiry No. 9083.—Wanted, the address of firms manufacturing small beer brewing plants, from 75 to 100 gallons a day.

Inquiry No. 9084.—Wanted, the address of manufacturers of Irwin portable bath tubs.

Inquiry No. 9085.—Wanted, to buy longitudinal hollow perforated tubing.

Inquiry No. 9086.—Wanted, to buy a pine wood peeler.

Inquiry No. 9087.—Wanted, a machine for hardening hack saw blades; also a machine for setting same when they have been toothed.

Inquiry No. 9090.—Wanted manufacturers of suspender and supporters supplies, also patent adjustable bachelor buttons.

Inquiry No. 9092.—Wanted, the address of some firms who manufacture permanent lamp wicks.

Inquiry No. 9094.—Wanted address of The Thomas Arithometer Company also Burkhart Arithometer Company.

Inquiry No. 9095.—Wanted, name and address of the manufacturer of the duplex revolving pencil sharpener.

Inquiry No. 9096.—Wanted, the address of manufacturers of spiral welded pipes, possessing great strength.

Inquiry No. 9097.—Wanted, address of makers of impulse water wheels.

Inquiry No. 9098.—Wanted, name and address of the manufacturers of the ozonizer.

Inquiry No. 9099.—Wanted, address of manufacturers of machinery for making wire cables.

Inquiry No. 9101.—Wanted, addresses of manufacturers of a dip or magnetic needle, for exploring for iron ore.

Inquiry No. 9104.—Wanted, addresses of manufacturers under the name of A. O. Co. Standard.

Inquiry No. 9106.—Wanted, addresses of cotton dealers who can furnish cotton material for manufacturing envelopes.

Inquiry No. 9107.—Wanted, addresses of manufacturers of small emery files (pieces of emery in the shape of a file).

Inquiry No. 9109.—Wanted addresses of the manufacturers of the Dion Desk Clock.

Inquiry No. 9110.—Wanted to buy machinery for reducing old tin cans, so that they may become a source of revenue.

Inquiry No. 9112.—Wanted sample small dry vacuum pump about 6-inch diameter cylinder inside, high temperature metal packing.

Inquiry No. 9113.—Wanted name and address of the manufacturers of the Russell Patent Automatic Ink Well.

Inquiry No. 9114.—Wanted name and address of manufacturer of the Auto Lantern Globe. Fits all lanterns.

Inquiry No. 9115.—Wanted a machine for making pen nibs, similar to Wm. Mitchell's G. & J. nibs and Waverly nibs.

Inquiry No. 9117.—Wanted names and address of the manufacturers of pedometers.

Inquiry No. 9118.—Wanted, a muffler for a gasoline engine, built upon the principle of the Maxim silencer, recently brought out for use on rifles.

Inquiry No. 9119.—Wanted, name and address of the manufacturer of Zeglin bullet-proof cloth.

Inquiry No. 9120.—Wanted, the address of the Ideal Fuel Feeder Co.

Inquiry No. 9121.—Wanted, manufacturers of cut stencils for fancy work, sofa pillows, etc., and oil colors and brushes for same.

Inquiry No. 9122.—Wanted, manufacturers of ditching machines used for tiledrains operated by horse power.

Inquiry No. 9124.—Wanted, name and address of a company in Germany making a machine to manufacture a cement and asbestos shingle and building lumber.

Inquiry No. 9125.—Wanted, name and address of the Just-Hatmaker machine, for manufacturing milk powder.

Inquiry No. 9127.—Wanted, address of L. Dermigny, manufacturer of a family ice machine for $10.00

Inquiry No. 9131.—Wanted, information as to how or where I could get a sample of tin ore.

Inquiry No. 9132.—Wanted, manufacturers of a gasoline traction engine with a hoisting attachment; in other words, the machine will be used as a portable stump puller to pull sassafras roots, used in making oil of sassafras.

Inquiry No. 9133.—Wanted, manufacturers of floss candy machines.

Inquiry No. 9134.—Wanted, a small hydraulic motor, capable of giving about one horse power with a water power of 25 lbs. per square inch.

Inquiry No. 9135.—Wanted, name and address of manufacturers of the Parshall Compressed Air Ice Machine.

Inquiry No. 9136.—Wanted, the name and address of a skunk raising farm.

Inquiry No. 9137.—Wanted, a device that will braid leather strips for horse whips.

Inquiry No. 9138.—Wanted, the address of manufacturers of machines capable of forming a number (12 or more) of pieces of paste about 35 mm. x 32 mm. x 6 mm., made of lead oxide and sulphuric acid, and placing them into a frame having a separate compartment for each piece, the space between each piece and the next being all round 4 mm. The process could be somewhat similar to biscuit making.

Inquiry No. 9139.—Wanted, the name and address of some manufacturer of a coffee mill run by water motor.

Inquiry No. 9140.—Wanted, manufacturers of disc records for gramaphones that use a sapphire point instead of a steel needle.

Inquiry No. 9141.—Wanted, a boat like a row-boat, worked by levers in place of oars, which by a series of pulleys attached operates a propeller, the steering device is managed with the feet.

Inquiry No. 9142.—Wanted, an appliance used in ice chests to make ice last longer.

Nut, lock, P. A. Alt	954,010
Oil cup, J. P. Doyle	954,173
Oil tank, safety, Weston & Orth	954,152
Ore concentrating and separating apparatus, F. Dallemagne	953,900
Ore concentration, apparatus for, T. J. Hoover	953,746
Ore crushing machinery, E. C. Hutchinson	954,295
Ore separating apparatus, magnetic, Q. Bent	954,016
Ore separation, magnetic, Q. Bent	954,015
Ores, treating arsenid, F. P. Dewey	954,264
Orthopedic device, L. Roth	954,005
Oven, baker's, J. C. Ferger	954,385
Packing, metallic, W. H. Law	954,195
Packing, metallic, E. Passono	954,203
Packing ring, piston, J. J. Redner	953,713
Pail, milking, F. H. Newlove	954,129
Paper coating machine, E. Williams	953,728
Paper into strips and printing scales thereon, apparatus for cutting, E. Elgner	953,742
Paper making machines, couch roll for, C. H. Smith	954,055
Paper receptacle, C. F. Jenkins	954,104, 954,105
Paper trimmer, Pierce & Colthar	953,856
Paper tubes, apparatus for securing closures in, C. F. Jenkins	954,108
Paring machines, apple, W. R. Phillips	954,340
Pedal action, L. W. Norcross	954,043
Peeler, R. Powell	954,047
Pen, H. W. Kueffner	954,306
Pencil sharpener, F. E. Hiner	953,998
Photographic printing apparatus, W. C. Huebner	954,290, 954,291
Photometer, candle foot, W. D. Ryan	953,765
Piano action, H. O. Clark	954,170
Piano action, grand, E. Schnabel	954,140
Piano agraffe, E. M. Hutchinson	954,189
Picture frame, B. Silfa	954,351
Pinion cutting machine, automatic, A. H. Neureuther	953,752, 953,753
Pipe. See Smoking pipe.	
Pipe attachment, A. Marr	954,316
Pipe coupling, W. R. Willetts	954,068
Pipe coupling, J. A. Fleming	954,177
Pipe couplings, clamping ring for, W. W. Price	953,799
Pipe threading tools, work holder for, I. W. Nonneman	953,971
Pipes, machine for the manufacture of earthenware, M. Yarrow	953,887
Planer head bits, holding device for, B. D. Stevens	954,146
Planing machines, sectional chip breaker for, W. R. Bass	954,376
Planing machines, work feeding apparatus for wood, C. W. H. Blood	953,814
Planter and fertilizer distributer, J. B. & C. B. Ebling	953,822
Planter marker, L. J. Lindsay	953,849
Planter, seed, I. N. Todd	953,870
Plow, J. W. Stallings	953,867
Plow, double shovel, L. C. Gregory	954,279
Plow frame, W. S. Hiett	953,997
Plow, grubber, V. O. Deyi	953,686
Plow, grubbing, C. D. Jauer	953,909
Plug, detachable, C. D. Platt	953,709
Plug, separable attachment, C. D. Platt	953,708
Plunger cables, means for tightening, F. C. Furlow	954,027
Pool table pocket, T. Maroney	953,853
Potato digger, R. W. McKay	953,988
Potato digger, J. M. Fallick	954,024
Potato digger, R. W. McKay	954,042
Powder for blasting, safety, Peters & Lindsley	953,798
Power shipping mechanism, W. H. Lafaelle	953,847
Power transmission, H. W. Fellows	954,384
Pressing machine, H. Lindestrom	954,314
Printing, A. O. Watkins	954,366
Printing machine, tapestry, G. W. Stokes	953,931
Printing press, S. Crump	954,379
Printing press feed mechanism, J. A. Kucha	953,840
Printing press inking mechanism, S. G. Goss	954,088
Printing press paper roll braking mechanism, S. G. Goss	954,089
Printing press plate clamping mechanism, S. G. Goss	954,090, 954,091
Printing presses, feeding gage for platen, B. Silfa	953,718
Prints, etc., making fast gray, G. Engi	954,273
Prison, portable, J. B. Kimbell	954,305
Propeller, H. F. Shaw	954,053
Propeller shafts, means for mounting, A. Clement	954,077
Pull sleeve, pipe or cable support of connector, combination, J. Fountain, Jr	954,081
Puller. See Stalk puller.	
Pulley dressing, Lolx & Lowy	953,699
Pulp, C. W. Roberts	954,209
Pulp and for similar purposes, cylinder machine for straining wood, H. Gaara	953,744
Pulp stock separator, G. S. Witham, Sr	954,154
Pump, C. H. Scott	954,051
Pump, self-measuring, C. F. Hatmaker	954,097
Pump stand, J. J. Hess	953,830
Pump terminal, suction, C. D. Durkee	954,269
Pump, vacuum membrane, M. Falk	953,945
Pumps, inlet valve and water screen for, O. H. Lillyman	954,313
Puzzle, R. L. Hicks	953,908
Quilling machine attachment, W. B. Lovatt	953,914
Rack. See Garment rack.	
Rail cleaner, J. P. Gorman	954,278
Rail joint, T. L. Humble	953,786
Rail joint, A. G. Broussard	954,251
Rail joint, F. R. Bush	954,347
Rail joint lock, H. L. Mason	954,120
Rail lubricating apparatus, Farley & McDonald	954,393
Rail tie and fastening, W. F. Beck	954,248
Railway rail anchor, D. H. Foreman	954,409
Railway system, electric, E. W. Radius	954,342
Railway tie, G. H. Martin	954,000
Railway tie, H. S. Rice	954,345
Railway tie, metallic, W. J. Allsbrooks	953,984
Railway track construction, J. W. Blower	954,163, 954,249
Razor, safety, T. C. Durham	953,989
Receptacle, J. M. Rau	954,206
Receptacle closures, apparatus for forming and inserting, C. F. Jenkins	954,107
Receptacles, machine for inserting closures in, C. F. Jenkins	954,106
Refrigerating and ice making apparatus, Pfleiderer & Harris	953,972
Regulating device, C. G. Sprade	954,057
Remedy for swine plague, A. Franke	953,947
Removable rim wheel, R. H. Buckingham	954,076
Repair member, J. Heck	954,098
Retoothing machine, J. P. Hedstrom	953,692
Revetment, F. W. Hawkes	954,283
Revolving cylinder motor, reversible, W. C. Smith	953,979
Rim, demountable, E. J. Blushey	954,375
Rod elevator, G. B. Rogers	953,976
Roll pinning machine, F. P. Hoffman	954,186
Rolling mill for tubes, A. J. McGinness	954,201
Rolling wheels, means for, A. K. Andrews	954,245
Rotary engine, S. A. Miles	953,964
Rotary engine, N. Bindrup	954,162
Rotary gas engine, L. A. Lang	953,788
Running gear, W. E. Groover	953,689
Sand molding machine, W. C. Norcross	954,399
Sash weight mold, E. D. Levering	953,999
Sash, window, W. P. Perkins	954,003
Saw gage, G. A. Lambert	954,192
Scale, A. P. Johnstone	954,302
Screen. See Vehicle wind screen.	
Screw-driver, A. N. Bender	954,073
Seal, box, E. J. Brooks	954,250
Sealing bottles and other vessels, E. P. Wetmore	954,406
Sealing cap for bottles, E. P. Wetmore	954,405
Sealing device, L. B. Edgar	954,271
Seat structure, spring, F. O'Brien	954,331
Seeder, F. G. Stitchman	953,929
Seeding machine boot, G. F. Danielson	953,902
Separator and stacker, E. J. Vraalstad	954,365
Sewing machine, button, P. E. Schoen	953,977
Sewing stand, J. Silknitter	953,767
Shade roller, A. Kaiserman	953,842
Sharpener for scissors, knives, and the like, J. Holt	954,289
Sharpening saw teeth, machine for, N. J. Chambers	953,895
Shaving set, H. J. Gaisman	953,948
Shears gage, J. L. Klindworth	954,398
Shears, tension device for, G. A. Parker	953,705
Sheep hook, J. A. Ross	953,714
Sheet jogging machine, A. F. Roessle	954,136
Shelf covering, L. Gastram	954,179
Shifting device, H. Drewell	953,988
Shingling bracket, F. L. Spring	953,981
Ships or vessels, transferring device for, F. Roeder	954,135
Ships' riggings to chain plates, turnbuckle for attaching, C. W. Cattenburg	953,896
Shirt, N. H. Rankin	953,974
Shoe fastener, W. H. Harris	954,390
Shoe polishing machine, Oliver & Ohigart	953,919
Shoe tree and stretcher, C. A. Johnson	953,747
Shutter, metallic window, E. W. Gray	953,995
Shutter worker, H. Osborne	953,703
Sign board, W. L. Turner	953,871
Sink bracket, J. P. Reynolds	953,857
Skins, hides, or the like, machine for dressing or otherwise operating upon, W. A. Wust	953,936
Skirt supporter and blouse retainer, W. J. Taylor	954,982
Sled, automobile, W. C. Niemann	954,130
Sled runner, J. Bystrom	954,377
Smoking pipe, sanitary, A. Cibulas	954,020
Snap hook, W. A. Schleicher	954,216
Snow cleaning machine, A. Mason	954,118
Soap box J. G. Rote	954,211
Soldering iron furnace, S. T. Wilison	954,235
Soldering tool, J. E. Pettit	953,920
Spike, expansion key, H. S. Patterson	954,204
Spike holder, H. O. Crippen	953,987
Spindle. See Spinning spindle.	
Spinning apparatus, traverse motion for yarn, A. E. Rhoades	954,343
Spinning machinery, C. T. Atherton	954,012
Spinning mule, W. D. Rundlett	953,801
Spinning spindle, Bergmann & Klotzer	953,813
Stacker, hay, D. C. Crook	954,171
Stacking apparatus, grain, Adkinson & Cady	953,679
Stalk puller, A. Redding	953,712
Stamp and label affixer, G. E. Lacey	954,307
Stamp, hand, W. Skow	954,353
Stamps, labels, and the like from sheets and attaching same to any desired object or matter, means for detaching, F. Meyer	954,321
Steam boiler and furnace, combined, W. D. Pine	953,921
Steam trap, E. Engebretsen	954,175
Steaming and pressing machine, Stratton & Petrie	953,805
Steel, making manganese, H. D. Hibbard	954,185
Steel, making manganese, H. M. Howe	954,188
Steel tie form, G. R. Bentley	953,892
Stenciling and marking pot, T. F. Ardlone	954,371
Step and platform, adjustable, Allfree & England	953,733
Stick horse, L. R. Nidermaier	953,755
Stove for heating buildings or like purposes, G. A. Wikstrom	954,153
Stovepipe attachment, C. D. Pearce	953,707
Stovepipe or flue cap fastener, J. E. Lang	954,308
Subsoiler, E. G. Bishop	953,893
Sweepers, attachment for vacuum, J. Broekema	954,164
Swing, lawn, G. H. Michael	954,197
Switch alarm, electric, W. F. J. Entrikin	954,176
Switch and fuse support, W. J. Gibbons	953,782
Syringe, double-acting, P. G. MacGregor	954,398

Table, E. C. R. Ellsworth	953,823
Tap or valve, ball, A. F. Morrison	954,040
Taximeters, recording device for use with, F. H. Rogers	953,975
Teat cup, Klein & Brown	954,110
Telautograph, G. S. Tiffany	954,062, 954,150
Telegraph instrument, W. M. Jackson	954,298
Telegraph system, alternating current, C. Meyer	953,701
Telephone bell or ringer, P. C. Burns	954,167
Telephone mouthpiece, H. Berg-Jager	954,372
Telephone receiver, J. Noble	953,970
Telephone repeater, P. Stragiotti	954,402
Telescope, gun bore sighting, A. Konig	953,696
Thread board, W. O. Aldrich	953,732
Threshing machine, W. A. Hollingsworth	953,833
Threshing machine concave attachment, R. C. Knaak	953,845
Ticket holder, car, L. Ingiee	953,953
Ticket receptacle indicator, H. J. Muller	953,751
Tie. See Metallic tie.	
Tile roofing, Arnold & Bootes	953,939
Time recorder, J. C. Swallow	954,403
Time recording and indicating apparatus, workman's tell-tale, and the like, F. M. Russell	953,802
Tire and fastening means therefor, vehicle, J. A. Swinehart	954,225
Tire armor, W. W. Tompkins	954,362
Tire shield, metal, A. J. Walker	953,873
Tire tread, D. T. O'Sullivan	954,333
Tire tread, pneumatic, F. G. Ward	954,232
Tire, vehicle, B. C. Swinehart	954,224
Tire, vehicle, H. O. Clark	954,255
Tire, vehicle, H. B. Tobias	954,361
Tobacco pouch, A. Kohout	954,034
Toilet cabinet, M. Schultz	954,143
Tool case, G. Stockinger	953,930
Tool, combination, T. P. Tivy	953,806
Tool handle securing means, W. L. Covert	954,259
Tool holder, C. Quast	954,049
Tools, combination attachment for, D. E. Shaw	953,863
Tooth, artificial, E. P. Off	953,702
Torpedoes, exploder for automobile, F. M. Leavitt	953,848
Toy, flying, L. Briggs	953,942
Toy projectile, W. D. Trimble	954,404
Toy, surprise or joke, J. L. Kellogg	954,031
Tracheal cannula or tube, J. B. Rogers	953,922
Train order hoops, catcher for, G. E. Johnson	954,300
Tread motor, P. W. Peters	954,339
Trolley, G. E. Lynch	953,915
Trolley heat for electric cars, C. S. Bayley	954,014
Trolley retriever, Schingle & Hodge	954,139
Trolley wheel, A. M. Levering	954,312
Trolley wire crossing, Griswold & Kerin	953,996
Truck, P. Schedin	953,862
Truck, car, J. C. Barber	953,681
Trunk, W. Sachs	953,715
Trunk, E. E. Boyd	953,815
Trunk protector, E. N. Thain	954,360
Trunk, tire, H. Cohen	953,735, 953,736
Truss, G. R. Harding	953,691
Tube cleaning apparatus, A. Morrison	954,002
Tube covering die, E. Jones	954,030
Tubing, machine for making metal, S. Jackson	953,955
Turbine balancing means, C. Roth	954,212
Turbine governing mechanism, E. E. Arnold	954,011
Turnstile, H. A. Gordon	954,182
Twist drill, Wing & O'Reilly	953,883
Type casting machine mold, automatic, H. H. Hardinge	954,028
Type setting machines, machine for perforating bands of, H. Drewell	954,023
Typewriter, E. M. Waring	953,875
Typewriter carriage return mechanism, N. L. Anderson	953,938
Typewriters, back feed mechanism for, M. B. Sargent	954,138
Typewriters, word counting device for, W. D. Girand	954,277
Typewriting machine, H. S. McCormack	953,797
Typewriting machine, J. C. McLaughlin	953,794
Typewriting machine, G. B. Brand	953,816
Typewriting machine, H. S. McCormack	953,854
Typewriting machine, E. A. Cook	953,898
Typewriting machine copy holder, T. L. Knapp	954,111
Typewriting machine tray attachment, I. H. Mallin	953,851
Umbrella, R. L. & T. Susemihl	954,357
Universal joint, T. F. Tinsby	954,228
Vacuum resistance furnace, A. O. Appelberg	953,774
Valve, S. A. Biggers	953,683
Valve, J. B. Beam	953,940
Valve, G. Dalen	954,172
Valve controller, adjustable, E. Schulte	953,706
Valve fitting, compression, P. Mueller	953,966
Valve fitting, fuller, P. Mueller	953,967
Valve, flushing tank, E. J. Wackerle	954,085
Valve for carburetors, etc., automatic, M. D. Colbath	954,258
Valve for pneumatic control systems, air, L. S. Nash	953,795
Valve, gas cut off, O. A. Giffen	954,180
Valve gear, H. Forbes	953,993
Valve gear for explosive engines, W. J. McVicker, reissue	13,099
Valve, etc., hopper, Hunt & King	954,293
Valve, etc., hopper, C. W. Hunt	954,294
Valve, overflow, and strainer, combined waste, A. S. Newton	953,754
Vapor burner, A. C. Smith	953,978
Vapor burner, M. Gratz	954,092
Vaporizing apparatus, fluid, G. H. Benjamin	953,682
Vegetable cutter and grater, S. I. Meserauil	953,790
Vehicle, D. W. Martin	954,317
Vehicle spring, R. W. Morse	953,750
Vehicle wheel, R. C. Duguid	953,780
Vehicle wheel, E. F. Maybaum	953,916
Vehicle, wheeled, J. Kuebodeaux	953,697
Vehicle wind screen, adjustable, C. Steane	953,804
Vehicle wind shield, C. Tolman	953,723
Vending apparatus, coin controlled, T. H. Duncombe	953,739
Vending machine, ticket, W. Hollingsworth	954,393
Vise, saw, W. T. Swain	954,148
Wagon brake, R. E. Turner	954,229
Wagon brake, W. E. Woods	954,238
Wagon, dump, C. M. Haeske	953,783
Wagon dump lifting jack, B. M. Steele	954,145
Warping machine attachment, T. A. Moore	954,199
Washboard cabinet, stationary, A. J. Matter	954,121
Washing machine, G. S. Winant	953,882
Washing machine, R. G. Irey	954,103
Washing machine, J. Hoffmann	954,187
Water heater, J. W. Hardie	953,690
Water tank, hot, J. J. Kelly	953,958
Wheel. See Automobile wheel.	
Wheel, C. W. Price	954,048
Wheel, E. G. Murtaugh	954,124
Wheels, extension rim for traction engine, T. Schele	954,214
Winding machines, lubricating attachment for, S. Broadwin	954,374
Windlass, J. S. Oram	954,32
Windmill, C. S. Agre	953,880
Window, E. & L. H. Stanecky	954,356
Window cleaner, S. Y. Yoshikawa	954,229
Window cleaner, L. H. Arnt	954,158
Window pane fastener, J. E. Smith	953,866
Window provision receptacle, W. P. Sellers	953,803
Window screen, W. J. Baker	953,680
Window screen, W. W. Payntar	953,758
Wire or band tightening implement, N. & J. N. Thomas	954,226
Wire working, needle pointing, or the like, machine for, F. R. Eden	953,741
Woodworking shaper, J. Hauser	953,949
Wrench, W. G. Royal	954,213
Wrench, J. Johnson	954,301
Wrench, H. Page	954,335
X-ray system, H. C. Snook	954,056
Yarn ball, cylindrical, A. E. Rhoades	954,344

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